COMMISSION 27 OF THE I.A.U.

INFORMATION BULLETIN ON VARIABLE STARS

Nos. 1401 - 1500
1978 March - 1978 November

EDITOR: B. SZEIDL, KONKOLY OBSERVATORY

1525 BUDAPEST, Box 67, Hungary

CONTENTS

1978

AUTHOR INDEX

INDEX OF VARIABLES

Variables in Clusters:

X-ray Sources:

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1401

Konkoly Observatory
Budapest
1978 March 29

A NEW SEMIREGULAR VARIABLE IN CANCER

On about 140 photographs taken between March, 1974 and June, 1977 a new semiregular variable which probably belongs to SRb type was found. The position of the star is,

$\alpha = 8^h57^m56^s$ $\delta = +8^\circ35'.9$ (1900.0)

Photographic material is super panchromatic emulsion with yellow-green filter which gives brightness very close to visual magnitude. The range of variation is $10^m.0-11^m.0$ so far. The light curve is fairly irregular as shown in Figure 1, but it seems to have periodicity of roughly 110 days. Figure 2 is the finding chart of the star.

M. HURUHATA
Hodozawa 88,
Gotemba-shi, 412
Japan

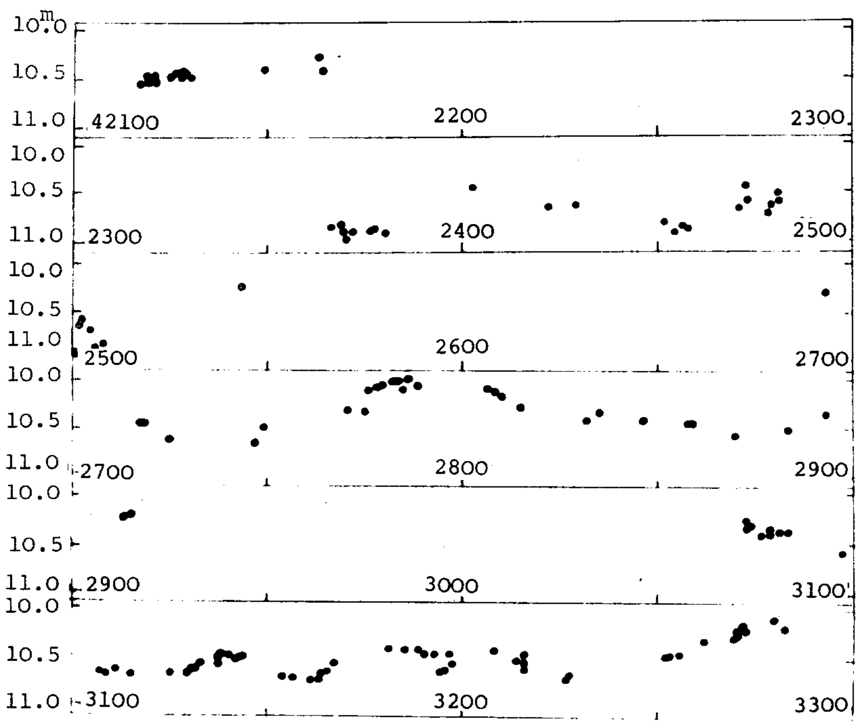


Figure 1

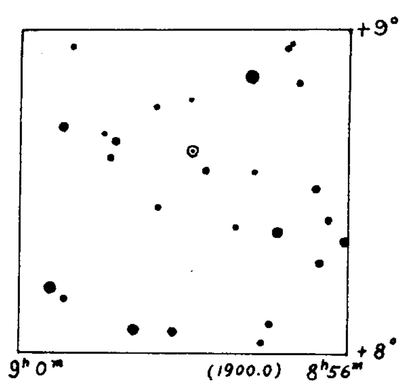


Figure 2

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1402

Konkoly Observatory
Budapest
1978 March 29

VARIATIONS DE PERIODE DES CEPHEIDES

Vasiljanovskaya et Erleksova (1968) ont mis en évidence l'existence d'une corrélation entre la période des céphéides de population II et l'amplitude des variations brusques de la période de ces étoiles. Par ailleurs, miss Hoffleit (1976) a montré qu'une telle corrélation doit exister aussi pour les variations continues et s'étend aux céphéides de population I, aux étoiles RR Lyr, aux semi-régulières et aux variables à longue periode.

J'ai cherché à préciser la valeur de cette corrélation dans le cas des céphéides. Pour celà, j'ai sélectionné 111 étoiles: dans la presque totalité des cas, les maxima ont été observés photoélectriquement et les variations de P sont maintenant bien connues. J'ai par contre eliminé quelques étoiles, comme ST Pup, dont les fluctuations de P sont très importantes, mais mal connues.

Dans la plus grande partie des cas, les renseignements concernant les variations de période sont extraits du "General Catalogue of variable stars" et de ses suppléments. Pour quelques étoiles,nous avons utilisé des valeurs publiées récemment ou en cours de publication.

On utilise l'amplitude <u>maximale</u> des variations de période ΔP pour déterminer:

- la valeur de la variation ramenée à l'unité de période $\frac{\Delta P}{P}$
- comme ΔP peut dependre de la longueur des observations on tient compte de E, nombre de maxima ecoulés du début à la fin des observations et l'on détermine $\frac{\Delta P}{PE}$, valeur <u>moyenne</u> de la variation de P en un jour. On voit (Figure 1) la correlation qui existe entre log P et log $\frac{\Delta P}{PE}$.

Voici les resultats obtenus pour trois classes de céphéides (Cδ, céphéides typiques, Cδs, céphéides de faible amplitude, CW étoiles de population II) et pour diverses valeurs de la periode:

types et log P		n; étoiles	$\log\frac{\Delta P}{PE}$	σ
Cδ	log P< 0.95	22	-7.431	0.677
Cδ	0.95<logP<1.3	25	-6.775	0.68
Cδ	logP>1.3	15	-5.794	0.695
Cδs	logP<0.95	14	-7.245	0.645
Cδs	0.95<logP<1.3	6	-6.528	0.22
CW	logP<0.95	11	-7.884	0.100
CW	0.95<logP<1.3	8	-6.106	0.380
CW	logP>1.3	10	-5.220	0.612

Les valeurs moyennes de $\log\frac{\Delta P}{PE}$ sont significativement différentes selon les groupes de périodes. En effet, si l'on regroupe les céphéides dans tenir compte du type on obtient:

47 étoiles	log P< 0.95	$\log\frac{\Delta P}{PE} = -7.432$
39 étoiles	0.95<log P<1.3	" = -6.599
25 étoiles	log P>1.3	" = -5.564

Il y a dans chaque groupe un rapport 10 dans les valeurs de $\frac{\Delta P}{PE}$, ce qui confirme les résultats de miss Hoffleit.

Le coefficient de corrélation R est de +0.752 pour le type Cδ, +0.505 pour Cδs et +0.923 pour CW.

Le fréquence des étoiles à période non stable est plus grande pour les périodes longues que pour les periodes courtes. Parmi 351 céphéides observées en U-B-V, 107 ont des variations de période. Leur répartition est la suivante:

P	n.Cep.	n.var. P	% var. P
log P<0.95	229	49	21.4 %
0.95<log P<1.3	88	36	40.9 %
log P>1.3	34	22	64.7 %
Total	351	107	30.5 %

L'instabilité des périodes est plus fréquente sur le type CW (43.7%) que sur le type Cδ (25.6%).

Je remercie Mr J.Le Kieffre, qui a calculé le coefficient de corrélation, et Mr J.M. Lamotte qui a exécuté la Figure 1.

MICHEL PETIT

Références:

Hoffleit, D., 1976, I.B.V.S. No.1131

Vasiljanovskaya, O.P., Erleksova, G.E., 1968, Non-periodic Phenomena in Variable Stars p 321, ed. L.Detre, Budapest

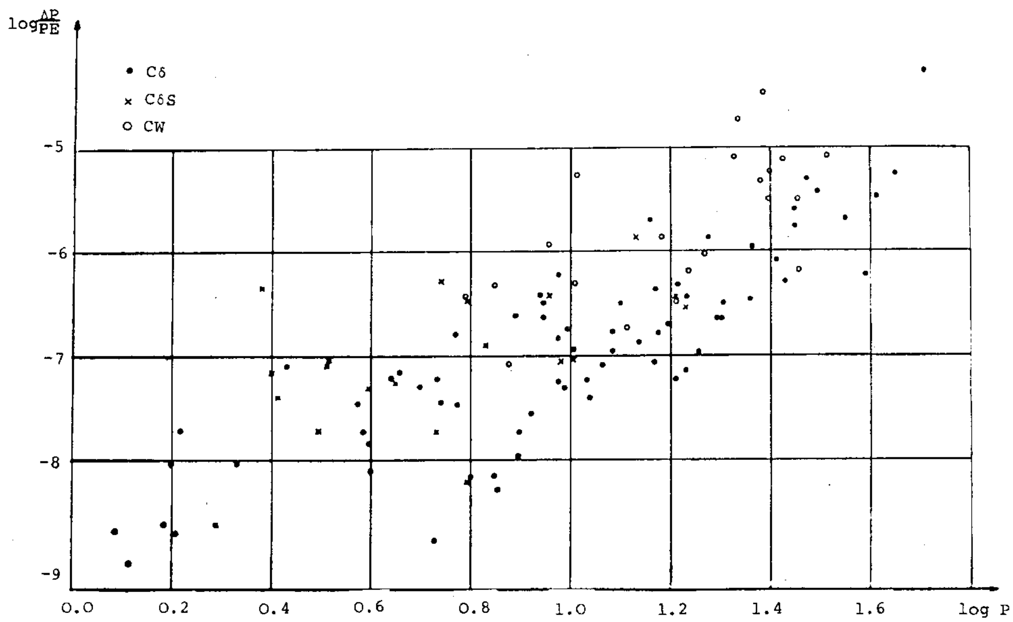


Figure 1

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1403

Konkoly Observatory
Budapest
1978 March 30

PERIOD CHANGES OF THE BINARY SYSTEM RX CASSIOPEIAE

The investigation of period changes of the Beta Lyrae-type eclipsing binary RX Cas was based on 25 epochs of primary and secondary minima listed in Table 1. The $(O-C)_1$ values were calculated according to Martynov's (1950) elements:

$$\text{Min.} = \text{J.D. } 241\ 6250.731 + 32.3165 \cdot E \qquad (1)$$

The last times of minima indicate that the period appears to be increasing. On the basis of all available material new elements with second order term were calculated. A least squares solution gives:

$$\text{Min.} = \text{J.D. } 241\ 6251.10 + 32.3100 \cdot E + 1.39 \cdot 10^{-5} \cdot E^2 \qquad (2)$$
$$\pm 13 \qquad \pm 6 \qquad \pm 6$$

The $(O-C)_2$ values in Table 1 were calculated according to above mentioned elements. As it is seen in the Figure a parabolic-like fit is a good approximation of changes of period. From the elements (2) the following results were obtained:

$$\Delta P = 2.40 \text{ sec epoch}^{-1}$$
$$\frac{\Delta P}{P} = 0.86 \cdot 10^{-6}$$
$$\frac{d \ln P}{dt} = 0.97 \cdot 10^{-5}$$

Thus, RX Cas is one of the binary systems with extremely large changes of period. This is with a good agreement with Paczynski's (1971) suggestion that all binaries with Beta Lyrae - type light curves and periods longer than 10 days may be suspected to be in a phase of rapid evolution connected with rapid transfer of matter. Further photoelectric and spectral observations of this interesting system would be very desirable.

J.M. KREINER

Silesian University, Katowice
Institute of Physics
Astronomical Laboratory

Table 1

J.D. hel.	Epoch	$(O-C)_1$	$(O-C)_2$	Source
2416250.9	0	+0.169	-0.200	1
7511.19	39	+0.116	-0.021	1
8803.780	79	+0.046	+0.103	1
2422907.75	206	-0.180	+0.200	2
3198.31	215	-0.469	-0.083	1
4943.60	269	-0.270	+0.104	1
5492.93	286	-0.320	+0.033	1
6947.213	331	-0.280	-0.020	1
7464.325	347	-0.232	-0.019	1
7916.931	361	-0.057	+0.110	1
8434.108	377	+0.057	+0.162	1
8886.456	391	-0.027	+0.021	1
9338.987	405	+0.074	+0.057	1
9662.334	415	+0.256	+0.190	1
9855.735	421	-0.243	-0.339	3
2430050.037	427	+0.161	+0.033	1
0534.971	442	+0.347	+0.135	1
0890.075	453	-0.031	-0.307	1
1116.6	460	+0.279	-0.041	1
3540.85	535	+0.792	-0.079	4
4154.90	554	+0.828	-0.206	4
2442706.5 sec	818.5	+4.714	+0.353	5
2706.53 sec	818.5	+4.744	+0.383	6
2883.69	824	+4.163	-0.288	6
2883.7	824	+4.173	-0.278	5

1. Martynov (1950), 2. Gaposchkin (1941), 3. Gaposchkin (1953), 4. Domke, Pohl (1953), 5. Mallama et al. (1977), 6. Rhombs (1978).

References:

Domke, K., Pohl, E. 1953,A.N. 281, 113

Gaposchkin, S. 1941,Ap.J. 100, 230

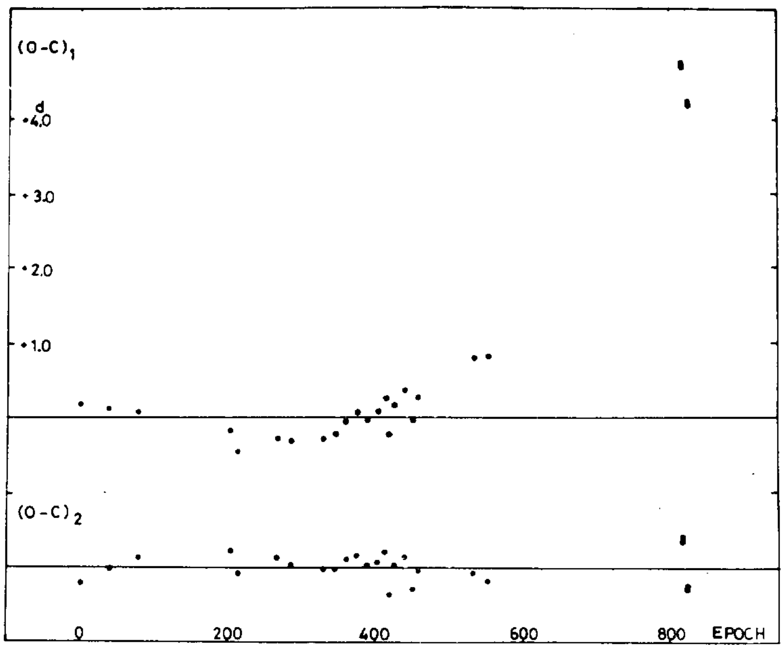
Gaposchkin, S. 1953,Harvard Ann. 113, 69

Mallama, A.D., Skillman, D.R., Pinto, P.A., Krobusek, B.A. 1977, I.B.V.S. No. 1249

Martynov, D.Ya. 1950,Engelhard Bull. No.27

Paczynski, B. 1971, A.Rev.Astr.Astrophys. 9, 183

Rhombs, C.G. 1978,Private communication



(O-C)₁
d
+4.0
+3.0
+2.0
+1.0
(O-C)₂
0
200
400
600
800
EPOCH

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1404

Konkoly Observatory
Budapest
1978 March 30

THE DISTORTION WAVE IN SS BOOTIS - DIRECT MIGRATION

The distortion wave in the RS CVn binary SS Bootis and its migration towards decreasing orbital phase was first noticed by Oliver (1974). There are now eight light curves useful for studying the wave, seven of them recent. These are summarized in the Table below.

Epoch	Observer	θ_{max}	ΔV	Reference
1935.0	Lause	$0^p.38$	$0^m.25$	Lause (1936)
1967.0	Popper	0.68	0.2	Oliver (1974)
1969.5	Oliver	0.38	0.2	Oliver (1974)
1970.6	Oliver	0.30	0.19	Oliver (1974)
1972/73	Popper	0.35	0.06	Popper and Dumont (1977)
1975.5	Neff	0.58±0.11	0.051±0.006	Hall and Neff (1978)
1976.5	Henry	0.79±0.17	0.124±0.019	Henry (1978)
1977.5	Henry	0.08±0.19	0.096±0.023	Henry (1978)

The values of θ_{max}, the phase of the maximum of the wave, and ΔV, the amplitude of the wave from maximum to minimum, were determined in various ways. Values for the first light curve were determined from the magnitudes in Table 2 of Lause. Values for the next three were taken from Table 13 of Oliver. Values for the 1972/73 light curve were read graphically from Figure 2(b) of Popper and Dumont. Values and uncertainties for the last three were determined by Fourier analysis of the light outside eclipse.

The migration curve for the recent 10-year interval is plotted below. In the first half we see the retrograde migration, i.e., motion towards decreasing orbital phase, noticed by Oliver. In the second half, however, we see direct migration, i.e., motion towards increasing phase. This is the first case of direct migration we have ever seen in an RS CVn binary (Hall 1976).

According to the spot model of Hall (1972), retrograde migration is a consequence of spots or spot groups occurring at latitudes smaller than ϕ_{corot}, the corotating latitude. Direct migration

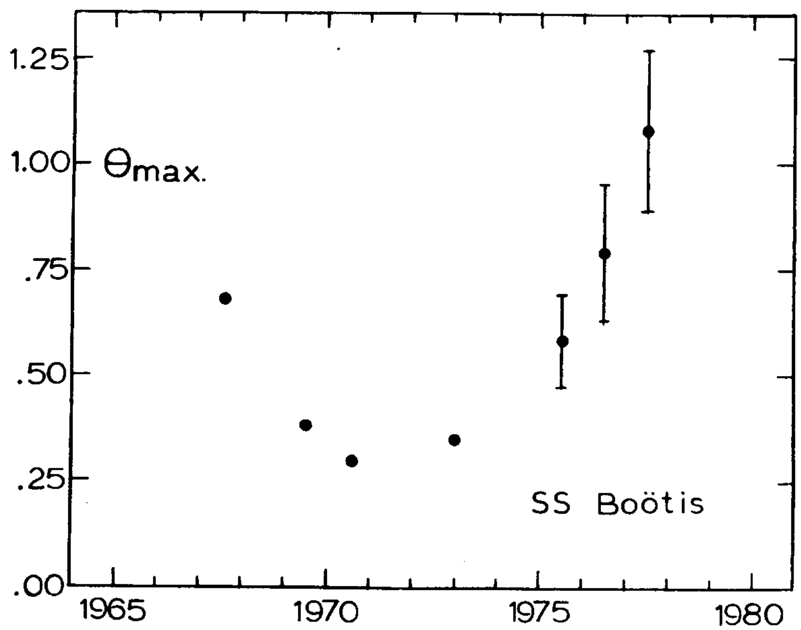


Figure 1

would imply that the spots lay predominantly at latitudes larger than ϕ_{corot}. Unfortunately there is no theory to determine the value of ϕ_{corot} in a given binary; the presumption is simply that it must lie somewhere between the equator and the poles.

In the spot model the variable rate of the migration is a consequence of latitude drift of the spots throughout the spot cycle, analogous to what is seen in our sun's "butterfly diagram". Maximum migration rate occurs when spots are farthest from ϕ_{corot} and minimum migration rate occurs when spots are closest to ϕ_{corot}. The butterfly diagram tells us that at sunspot minimum sunspots stop appearing at low latitudes and begin reappearing at high latitudes. The model thus predicts that an epoch when the migration rate makes a transition from its maximum retrograde rate to its minimum retrograde rate (or, in the case of SS Boo, a transition to direct migration) should coincide with an epoch of spot minimum. In the above figure such a transition occurs somewhere around 1973, so the prediction is that wave amplitude also should reach minimum around 1973. The amplitude curve for the same 10-year interval is plotted below.

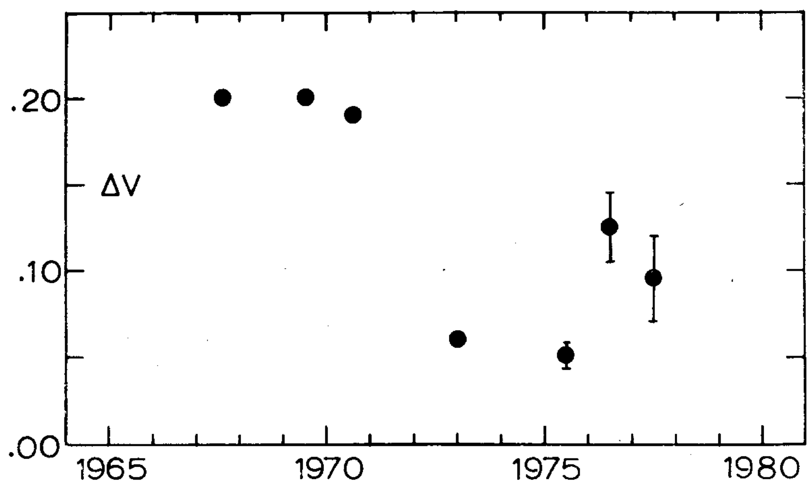


Figure 2

Since the two lowest values of ΔV are those of 1972/73 and 1975, it would seem that the prediction is confirmed, although the confirmation would be strengthened if the amplitude remains large or continues to increase. For that reason we are continuing photometric observation of SS Boo.

DOUGLAS S. HALL

GREGORY W. HENRY

Dyer Observatory
Vanderbilt University
Nashville,Tennessee
U.S.A. 37235

References:

Hall, D.S. 1972, P.A.S.P. 82, 323
Hall, D.S. 1976, I.A.U. Coll.No.29, Part I. 287
Hall, D.S. and Neff, S.G. 1978, in preparation
Henry, G.W. 1978, in preparation
Lause, F. 1936, A.N. 259, 191
Oliver, J.P. 1974, Ph.D. Thesis, University of California at Los Angeles
Popper, D.M. and Dumont, P.J. 1977, A.J. 82, 216

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1405

Konkoly Observatory
Budapest
1978 March 30

BO And, A LARGE AMPLITUDE ECLIPSING BINARY

In the third edition of the GCVS by Kukarkin et al. (1969) the light variation of the 5.79 days EA binary BO And = SVS 735 (spectral type B8 according to Bergedorfer Spektraldurchmusterung) is given from $13^m.0$ to fainter $14^m.0$. These data are based on the estimates of Sonneberg patrol plates by L. Meinunger (MVS 3, 197, 1966) who derived the period of $5^d.79725$. Also the discoverer of this variable, S. Beljawsky (VS 5, 36, 1936), indicated a similar brightness variation. In contrast to these values, A.N. Deutsch (VS 5, 225, 1939) and later on P.P. Parenago (3rd suppl. to 1st edition of the GCVS, 1951) report $>15^m.5$ and $>16^m.0$, respectively for the minimum magnitude.

During a blink survey of a variable star field centered at RA = $22^h39^m.5$, Decl. = $+47^\circ.1$ by one of the present authors (Ge) in 1961 on plates of the four lenses Bruce astrographic camera (f/5, f=200cm) of Heidelberg Observatory (HD), BO And was found on one plate near its limit, which is about 17^m. In recent years, for a preliminary study of the light curve of this binary further plates with the same center have been obtained with the four lenses astrographic camera (f/5, f=150cm) of the Hoher List Observatory (HL). On a total of 28 plates (16 HD-, 12 HL-plates) BO And has been measured with an iris photometer. The photographic magnitudes of the comparison stars, listed in Table 1 and identified in Figure 1, were established by several transfers from the nearby Selected Areas 42 on 3 HD- and 2 HL-plates. The large scatter of the characteristic iris-brightness relation is partly due to the badly known photographic magnitudes of the SA 42 standards. Accordingly from each single plate the least square fit of the characteristic iris-magnitude curve was used to correct the magnitudes. The averages from the five plates were adopted for the final magnitudes. Their standard deviations are about $\pm 0^m.05$. Since SA 42 and the surrounding of BO And have a distance of $2^\circ.4$ and $3^\circ.5$, respectively from the plate center, the given magnitudes for the comparison stars, and therefore also for BO And, are systematically too faint by some tenths of a magnitude, since the not well known differential field corrections have not been applied in Table 1.

It turned out that star C of this comparison sequence might be variable itself on a perhaps irregular time scale. These "variations" are more pronounced on Heidelberg plates, where this star is closer to the plate edges.

The obtained light curve of BO And is shown in Figure 2. Its brightness variations are between $13^{m}.38$ and $16^{m}.3$ in photographic light. There is an indication for a very short total eclipse phase in primary minimum. The secondary minimum is unobservable photographically. The light elements could be slightly improved by taking into account only those observed and published minima with brightnesses fainter than $15^{m}.0$:

$$\text{Min.} = \text{J.D. } 2428021.307 + \underset{\pm 0.00009}{5.79733} \cdot E \text{ (hel.)}$$

In Table 2 the time instants of the observed minima are listed on which these elements are based.

E. H. GEYER
A. HÄNEL
Sternwarte der Universität
Bonn, Observatorium Hoher
List, D-5568 Daun

Table 1

Photographic magnitudes of the comparison stars of BO And

Star	m_{pg}	m.e.	Remarks
A	12.98	±0.04	
B	13.07	0.05	comp.star a of Belj.
C	13.87	0.11	star probably variable
D	14.49	0.03	
E	14.99	0.04	
F	15.33	0.05	
G	15.41	0.06	
H	15.87	0.06	
I	15.99	0.08	
K	16.26	0.08	
L	16.28	0.10	
M	16.71	0.10	

Table 2

Observed minima($m_{pg}>15\overset{m}{.}0$) of BO And

J.D. hel. 2400000+	Observer[1)]	E	O-C
27360.310	D	-114	$-0\overset{d}{.}101$
28021.375	B	0	+0.068
28050.339	B	+5	+0.046
29969.300	P	336	+0.091
30705.350	M	463	-0.119
36079.544	M	1390	-0.048
36485.415	M	1460	+0.010
37546.435	HD	1643	+0.120
37563.568	HD	1646	-0.141
37575.419	M	1648	+0.116
37633.313	HD	1658	+0.037
38288.442	M	1771	+0.068
39059.378	M	1904	-0.041
39088.292	M	1909	-0.114
43123.355	HL	2605	+0.009

1) B=Beljawsky, D=Deutsch, HD,HL=Geyer/Hänel, M=Meinunger, P=Parenago.

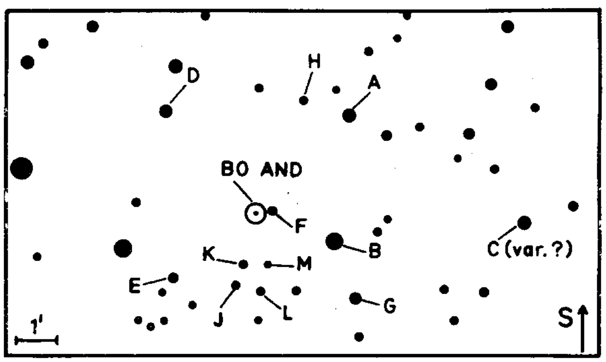


Fig. 1: Identification chart for the comparison stars of BO And

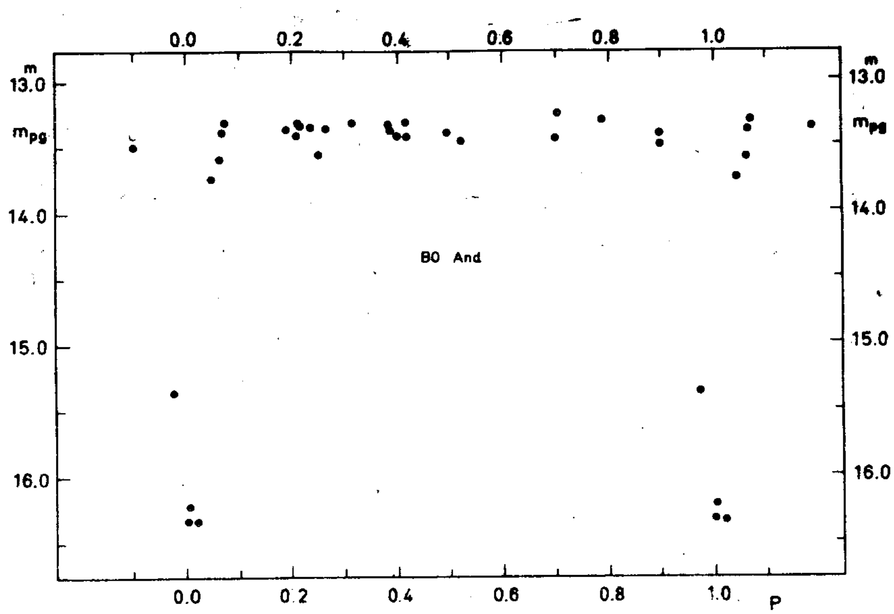


Fig. 2: Photographic light curve of BO And

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1406

Konkoly Observatory
Budapest
1978 April 3

A RED VARIABLE IN CIRCINUS

During a search for objects showing H-α line-emission a rather bright spectrum was found on an objective prism plate which corresponded to a faint star in the finding chart obtained from a direct plate taken at another epoch.

Since the star was not listed by Kukarkin et al. (1972) we decided to check its variability measuring with an iris photometer several B and V plates obtained by J.C. Muzzio from CTIO in May 1974 and April 1975. The star did not appear in U plates obtained in the same epochs and its ultraviolet magnitude was estimated fainter than 17.2 mag.

The 1950 coordinates are:

R.A= $15^h11^m.7$ Decl.=$-58^o57'$

and its position is shown in the charts.

The small scale chart was obtained from one of our visual plates and its size is about 10' x 20'. The large scale chart is a drawing from the screen of the iris photometer and its size is about 3' x 3'. In both cases North is above and West to the right.

Also shown in the large scale chart are the comparison stars used, whose adopted magnitudes are:

Star	V	B-V
a	12.51	0.64
b	13.99	1.19
c	14.59	1.05
d	15.21	1.03
e	15.30	1.40
f	15.40	1.18
g	15.64	1.20

These values were determined photographically extrapolating a photoelectric sequence which reached only V=13.66 and B=15.51. They may be thus affected by systematic errors but, nevertheless, they are useful to derive the light changes of the variable star. The observed magnitudes of the variable star are:

Heliocentric J.D.	V	Heliocentric J.D.	B
2442191.6343	15.00	2442191.7126	16.68
2191.7443	14.94	2191.7269	16.74
2194.7409	14.72	2194.7724	16.52
2194.7544	14.66	2507.7049	17.16
2507.7167	15.66	2509.8400	17.37
2508.8666	15.72		
2509.7662	15.60		

We also derived red magnitudes for the comparison stars with the formula

$$R=V-0.5(B-V)$$

and estimated visually the brightness of the variable on our H-α objective prism plates. On the July 1976 plate (J.D. 2442980.4871) neither the continuum nor the emission can be seen and the star should have been fainter than R=14.1 mag. On all the plates obtained in April 1977 (J.D. between 2443250.6719 and 2443261.7907) the continuum is fairly bright and the estimated magnitude is about R=12.1 mag; also H-α emission can be seen in four of the plates where the spectra are properly exposed while in the other two plates the spectra were overexposed.

All these values suggest a rather long period variation with an amplitude of at least 2 mag. in the red. Considering also the very red colour and that H-α emission is present on the April 1977 plates (when the star was much brighter than on the July 1976 plate) this star is almost surely a long period variable.

We are grateful to the authorities, staff members and night assistants of CTIO for their hospitality and help and to Dr.H.G. Marraco for the use of the July 1976 objective prism plate.

ANA M. ORSATTI* and J.C. MUZZIO**

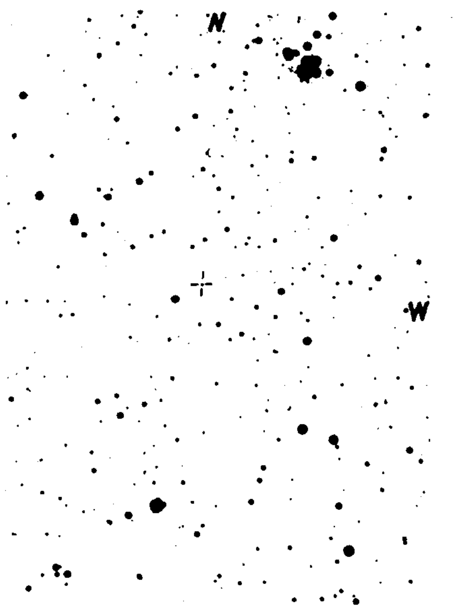
Observatorio Astronomico,Universidad Nacional
de La Plata, 1900 La Plata, Argentina

Reference:

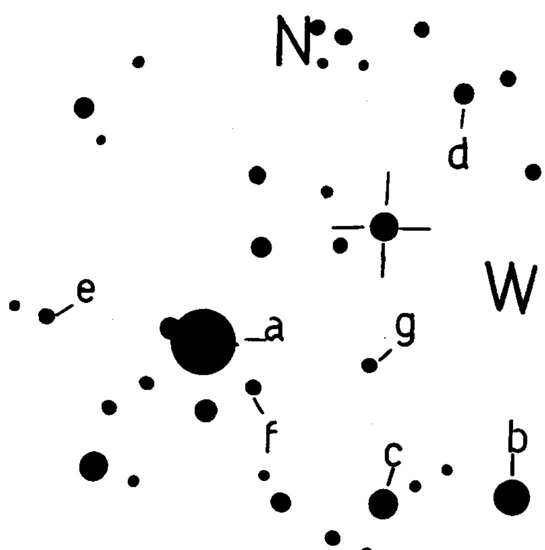
Kukarkin, B.V. et al.: 1972, Special Supplement to the Third Edition of the General Catalogue of Variable Stars, Moscow

* Visiting astronomer, Cerro Tololo Inter-American Observatory, supported by the National Science Foundation under contract No. NSF-C866.

** Member of the Carrera del Investigador Cientifico del Consejo Nacional de Investigaciones Cientificas y Tecnicas de la Republica Argentina.



N
W



N
W
a
b
c
d
e
f
g

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1407

Konkoly Observatory
Budapest
1978 April 3

GLIESE 867 - A NEW FLARE-STAR SYSTEM

Gliese 867 is a visual double star, both components of which are classified dMe (Dyer, 1954). Kunkel (1975) has included both stars in his list of known flare stars solely on the basis of their emission-line spectra (private communication). Bopp and Espenak (1977) have forwarded evidence for photometric variations in G867A. We confirm here that both G867A and B flare and that G867A undergoes significant night-to-night variations.

Observations were carried out on the 0.75 meter reflector at the South African Astronomical Observatory using a high-speed pulse-counting photometer belonging to the University of Cape Town's Department of Astronomy. The latter was equipped with an Amperex 56DVP photomultiplier tube and glass filters approximating to the Johnson UBV system. For further details of the instrumentation see Nather and Warner (1971).

G867A was monitored on six nights totalling 13.1 hours.Two flares were recorded one of which was preceded by a precursor. Details of the observations are given in Table 1(a). Table 1(b) gives results of observations of G867B totalling 6.6 hours, in which time twenty-one flares were observed. Light curves for these flares will be published elsewhere.

G867A was also compared on four nights in U, B and V to a nearby 10^m star y(α(1950)$\sim 22^h35^m\!.2$ δ(1950)$\sim -20^o42'\!.7$). This star was checked against HD214380 for constancy. No variations of amplitude greater than $0^m\!.003$ are indicated. Results are given in Table 2 as differential magnitudes in the sense $\Delta V' = V'(y) - V'(G867A)$ and are in an instrumental system, untransformed to Johnson UBV. Night-to-night variations are confirmed but our results show a tendency to be redder in (B-V) when brighter in V rather than the reverse as found by Bopp and Espenak (1977).

G867 is a particularly interesting flare star. Component B was extraordinarily active during the period of our observations.

Component A is also known to be a 4.1 day spectroscopic binary, both components of which are of the same spectral type. (Herbig and Moorhead, 1965). One, however, is considerably stronger in emission than the other. It would be of interest to determine whether one or both members of G867A contribute to the flaring and in what proportion.

Further study of the G867 system is now being planned. Application has been made for telescope time during August/September 1978. Observers interested in undertaking observations at this or another time could contact the undersigned with a view to making a coordinated effort.

P. BRENDAN BYRNE
Armagh Observatory
Armagh BT61 9DG
N. Ireland

References:

Bopp, B.W. and Espenak, F., Astron. J., 82, 916 (1977)
Dyer, E.R., Astron.J., 59, 218 (1954)
Herbig, G.H. and Moorhead, J.M., Astrophys.J., 141, 649 (1965)
Kunkel, W.E., "Variable Stars and Stellar Evolution", IAU Symp. No.67, Ed.V.E. Sherwood and L. Plaut., D.Reidel, Holland (1975) p. 15
Nather, R.E. and Warner, B., Mon. Not. R. Astron. Soc., 152, 209 (1971)

Table 1(a) - G867A

Date 1977	Time of Observation (U.T.) Begin	End	Flares Time of Peak	$I_f - I_o / I_o$	$3\sigma / I_o$	Comment Integration	Colour	General
Oct. 25	18.20.12	18.43.32				2^s	U only	
	18.54.29	19.20.09				"	"	
	19.28.54	19.59.54				"	"	
	20.10.51	20.46.31				"	"	
	20.54.29	20.58.19	20.57.05	0.404	0.036	"	"	Precursor?
	21.00.25	21.05.41	21.03.45	0.871	0.036	"	"	
	21.07.12	21.25.13				"	"	
	21.33.42	22.20.14				"	"	
Oct. 26	18.13.20	18.36.20				"	"	
	18.46.27	19.27.47				"	"	
	19.35.26	20.12.30				"	"	
	20.19.53	20.56.33				"	"	
	21.03.57	21.37.17				"	"	
	21.44.08	22.15.08				"	"	
	22.22.56	22.38.50				"	"	
Oct. 28	19.15.50	19.36.15				3^s	"	
	19.41.13	21.20.07	20.55.12	0.310	0.011	"	"	
	21.22.28	21.33.52				"	"	
Nov. 18	18.25.25	19.01.00				2^s each colour	UB&V	
	19.13.20	19.38.00				"	"	
	19.40.34	19.58.10				"	"	
Nov. 19	18.34.31	18.35.34				3^s each colour	"	
	18.37.26	20.15.00				"	"	
Nov. 21	19.12.34	20.28.00				"	"	

Table 1(b) - G867B

Date 1977	Time of Observation (U.T) Begin	End	Flares Time of Peak	$I_f - I_o / I_o$	$3\sigma / I_o$	Comment Integration	Colour	General
Sept. 10	21.20.52		21.25.32	0.271	0.038	2^s	U only	
			21.35.16	0.348	0.037	"	"	
			21.44.52*	0.332	0.038	"	"	*Between
			21.46.38*	0.346	0.038	"	"	21^h43^m and
			21.49.48*	0.533	0.038	"	"	22^h50^m,
			21.59.12*	0.648	0.038	"	"	there was
			22.09.09*	0.305	0.038	"	"	a general
			22.12.23*	0.515	0.038	"	"	rise in the
			22.19.07*	0.372	0.038	"	"	star's
			23.25.04	0.668	0.058	"	"	brightness
			23.36.00	0.285	0.058	"	"	of 20%. Am-
Sept. 11		00.45.01	00.06.29	0.264	0.058	"	"	plitudes of
" "	21.17.52	22.22.24	21.29.06	0.427	0.132	"	"	these flares
			21.34.40	0.213	0.132	"	"	are referred
			21.44.44	0.626	0.281	"	"	to the qui-
			22.01.48	0.340	0.234	"	"	escent part
			22.17.24	0.497	0.181	"	"	of the light
	22.24.36	23.06.46	22.45.30	0.219	0.130	"	"	curve.
	23.08.26	23.39.36	23.26.58	0.351	0.102	"	"	
	23.45.37		23.59.41	0.218	0.194	"	"	
Sept. 12		00.45.08	00.23.23	0.451	0.152	"	"	

Table 2 - G867A

Date	Time (U.T.)	Sec z	$\Delta V'$	$\Delta(B'-V')$	$\Delta(U'-B')$
25.10.1977	20:49	1.106	1.170	+1.947	+1.148
26.10.1977	20:14	1.052	1.059	+1.920	+1.030
18.11.1977	19:09	1.115	1.063	+1.916	+1.024
19.11.1977	18:30	1.061	1.085	+1.950	+1.087

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1408

Konkoly Observatory
Budapest
1978 April 3

PHOTOELECTRIC MAXIMUM OF SZ LYNCIS

The variable star SZ Lyncis (BD+44°1718, HD67390) was discovered by Hoffmeister (1949). Broglia (1963) classified SZ Lyn as a dwarf cepheid (AI Vel stars), having a period of near 0.12 day and a large amplitude light variation of $\Delta V \simeq .5$ magnitude. Van Genderen (1967) found that the variation in the times of maximum might fit a sine curve with a period of 1129 days. However, that data only covered about 1.6 cycles so the believability of the sine curve was somewhat uncertain. Barnes and Moffett (1975) reexamined all the published times of maximum and added 4 new timings. They found the times of maximum to vary with a period of approximately 1146 days having an amplitude of approximately 1000 sec. They felt that any doubt of the reality of the sinusoidal variation was now removed since 3.8 cycles had been observed and interpreted it to be a light-travel-time effect coming from the orbital motion of SZ Lyn about an unseen companion.

To see if the times of maximum would continue to follow the sinusiodal curve we observed SZ Lyn with the 76-cm telescope at the McDonald Observatory using the high speed photometer described by Nather and Warner (1971). The observations were obtained with an Amperex 56DVP photomultiplier and a standard set of Johnson UBV filters. The integration time was 10 sec/filter, yielding a cycle time of 40 seconds, a fourth filter position contained no filter.

TABLE I.
OBSERVED MAXIMA

$JD_{max\ o}$ + 2440000.	CYCLE	(O-C)	ψ
2531.7560	36565	+.0026	.846
2532.7210	36573	+.0034	.846
2533.6852	36581	+.0033	.846

The times of maximum brightness in the B bandpass, see Table I, were determined visually to an estimated accuracy of ±0.0007 day (1 min.). These times of maximum were compared to the non-linear ephemeris of Barnes and Moffett:

$$T_{(max)}(JD_o) = \underset{\pm.00017}{2,438,124.39828}+\underset{\pm.00000002}{0.120534906}(E)-\underset{\pm.00019}{0.00572}\cos2\pi(\underset{.0091x10^{-4}}{1.0518Ex10^{-4}}+\underset{\pm.008}{0.010})$$

We find that our average (O-C) value of 0.003 day is larger than the standard deviation (±0.002) for all the photoelectric data included in the determination of the non-linear ephemeris. This may suggest that a redetermination of the period be done with the new observations included. Before this is done, we feel that many more times of maximum are needed to achieve a greatly improved period. So it seems that the (O-C) diagram of SZ Lyn has followed a sine curve for at least 4.5 cycles having a period near 1150 days.

There is nothing in our observations to refute the idea that the variation in the times of maximum might be a light-travel-time effect.

JOHN AFRICANO
McDonald Observatory
Box 1337 Ft. Davis, Texas 79734

References:

Barnes, T. G., and Moffett, T. J. 1975, A. J. 80, 48.

Broglia, P. 1963, Mem. Soc. Astr. Ital. 34, 431.

Hoffmeister, C. 1949, Astr. Abhand. 12, 1.

Nather, R. E., and Warner, B. 1971, Mon. Not. R. Astr. Soc. 152, 209.

Van Genderen, A. M. 1967, Bull. Astr. Inst. Neth. 19, 74.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1409

Konkoly Observatory
Budapest
1978 April 4

PHOTOELECTRIC V LIGHT CURVE AND MINIMA OF RT And

We made 1032 photoelectric observations, in V light, of the eclipsing binary RT And (BD + 52° 3383 a) in 19 nights, between the end of 1972 and 1974.

A photometer, equipped with an EMI 9502 photomultiplier and a pair of Schott filters, GG14 + GG13 (2 mm), has been used, attached to the 40 cm looke refractor of the Teramo Observatory. From these data, eight times of primary minimum and three of the secondary one have been calculated: to get them we used the Kwee and van Woerden method (1956). Considering the times of our primary minima, those reported by Williamon (1974) from J.D. 2439000 on, and those given by Dean (1974), we obtained the linear ephemeris

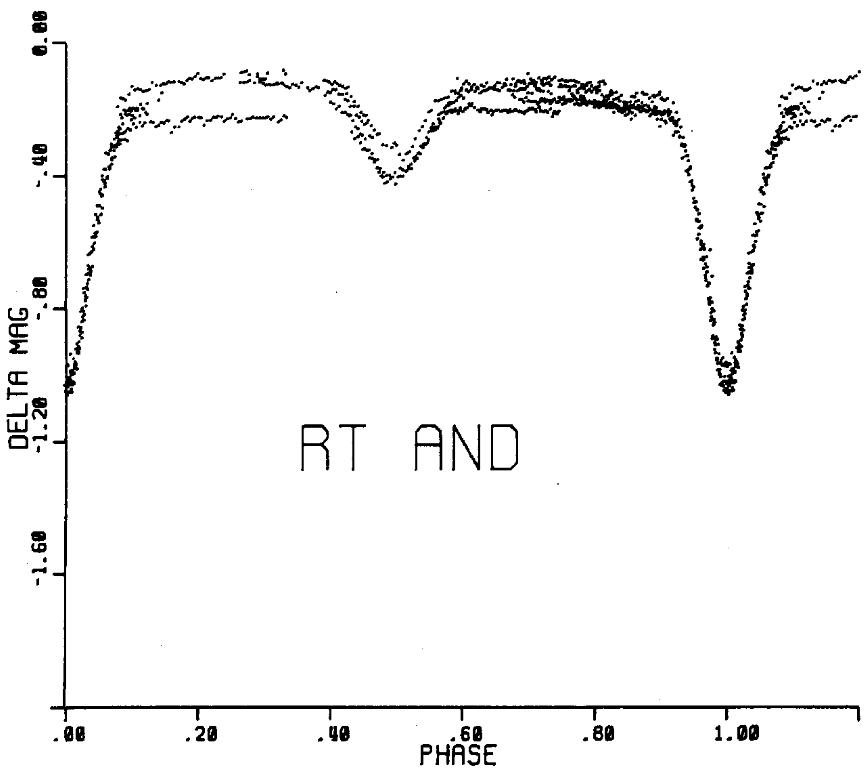
$$\text{Hel. J.D.Min. I} = \underset{\pm 1}{2441508.5550} + \underset{\pm 4}{0^{d}.62892990}\ E \tag{1}$$

We did not consider the secondary minima in the above calculation, because the relative measurements were not very reliable.

The table below lists our times of minimum and the corresponding (O - C)'s:

	J.D.	E	O - C	σ
	2441508.5563	0	+ 0.0013	± 0.0003
	41598.4911	143	- 0.0009	0.0006
	41627.4228	189	0.0000	0.0001
	41886.5418	601	- 0.0001	0.0001
*	42011.3852	799.5	+ 0.0007	0.0009
	42329.3092	1305	+ 0.0006	0.0003
	42330.5675	1307	+ 0.0011	0.0003
*	42338.4240	1319.5	- 0.0040	0.0004
	42339.3710	1321	- 0.0004	0.0002
*	42367.3586	1365.5	- 0.0002	0.0004
	42385.2832	1394	- 0.0001	0.0002

* Not used in the calculation of equation (1)



0.00
-.40
-.80
-1.20
-1.60
DELTA MAG
RT AND
.00
.20
.40
.60
.80
1.00
PHASE

The observations have been reduced in phase by using (1) and the resulting light curve (comp. star 1-var.) is shown in fig. 1.

Stars BD + 52° 3377 and BD + 52° 3380 have been used as comparison stars: the sequence of observations was

Sky, comp. star 1, Var., comp. star 2, Var., ...

With this procedure, we made a very careful analysis of the possible variability of the main comparison star: within an accuracy of $0\overset{m}{.}02$ we can conclude that it is not so.

Therefore the peculiarities of our light curve are to be attributed to RT And itself: these peculiarities are mainly a great variability in the levels of maxima and in the depths of the secondary minima, both from day to day and from year to year.

In a forthcoming paper, we will analyze the light curve of this star using different methods of solution.

S. MANCUSO L. MILANO
G. RUSSO C. SOLLAZZO

Capodimonte Astronomical Observatory
Naples, Italy

References:

Dean, C.A.: 1974, Pub. Astron. Soc. Pac. 86, 912
Kwee, K.K. and van Woerden, H.: 1956, Bull. Astron. Neth. 12, 327
Williamon, R.M.: 1974, Pub. Astron. Soc. Pac. 86, 924

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1410

Konkoly Observatory
Budapest
1978 April 4

A PHOTOMETRIC SEQUENCE FOR OI 090.4 AND ADDITIONAL INFORMATION ON CSV 1180

The Ohio Radio source OI 090.4 was reported by Tapia et al. (1977) to be a BL Lacertae object with unusually high polarization. During the determination of the photometric history of this object (Baumert and Craine 1978), it became apparent that a comparison sequence for this object would be extremely useful. Such a sequence is reported here.

Plates of good photometric quality in the plate files of Harvard College Observatory were measured with the iris photometer at Harvard College Observatory to provide comparison stars for OI 090.4. The stars labelled A, B, C in Figure 1 are the primary standards whose B magnitudes (14.98, 13.65, and 16.29 respectively) were determined photoelectrically for Baumert and Craine by Santiago Tapia. These stars were used to determine the photographic magnitudes of the stars reported here.

Figure 1 identifies the new photometric sequence in the field of OI 090.4. North is at the top of the figure and east is to the left; the plate scale is approximately 0!16/mm. Magnitudes for the comparison sequence, along with their mean errors and the number of plates used to determine the magnitudes, are given in Table I.

The suspected variable 1180 (=Ross 200=Prager 512) is close to the position of OI 090.4. Precessing the 1900 coordinates of CSV 1180 to 1950 yields the coordinate differences $\Delta\alpha = +1^{s}.9$ and $\Delta\delta = +0'.64$ between itself and OI 090.4. The closest object to these coordinates is the faint star just to the north and west of star 6 in Figure 1. However, Ross (1927), the discoverer of CSV 1180 states that his star had magnitudes 11 and 13 on Mar. 12, 1915, and Jan. 5, 1927, respectively. The star mentioned above is considerably fainter than CSV 1180, so its identity with the latter is doubtful. If star 6 is CSV 1180 it also is fainter than the magnitudes given by Ross by nearly 3 mag. Some of this difference may be attributed to a zero point difference between the magnitude systems, but it is unlikely that the difference would be that large. Also, the brightness of star 6 appears to be constant to within ±0.20 mag as given in Table I. It is interesting to note that Sandig (1947) did not find any object at Ross' position that varied by more than ±0.15 mag. Is it possible that Ross' position is slightly in error and that he observed a brightening of OI 090.4 in 1915 and 1927? The light curve of Baumert and Craine shows that OI 090.4 was brighter ($m=14.7$) than normal on Feb. 19, 1915, and was also brighter ($m \sim 15.5$) in 1927. The answer will probably never be definitely known, since Ross did not publish a finding chart for CSV 1180.

I would like to take this opportunity to thank Martha Liller for her assistance with the plate archives at Harvard College Observatory. This research was supported by a Faculty Research and Travel Grant from Connecticut College.

JOHN H. BAUMERT
Connecticut College
New London, Connecticut 06320
U.S.A.

References:

Baumert, J. H. and Craine, E. R. 1978 (in preparation).

Ross, F. E. 1927, Astron. J. 37, No. 882, 155.

Sandig, H.-U. 1947, A.N. 275, 37.

Tapia, S., Craine, E. R., Gearhart, M. R., Pacht, E., and Kraus, J. 1977, Astrophys. J. Lett. 215, L71.

Table I   The Photometric Sequence

Star	m	σ_m	n	Star	m	σ_m	n
1	14.5	±0.17	15	6	15.7	±0.20	16
2	14.4	.18	16	7	16.6	.12	4
3	16.3	.15	10	8	15.8	.14	11
4	15.1	.19	14	9	16.0	.24	12
5	15.9	.22	10	10	16.1	.17	7

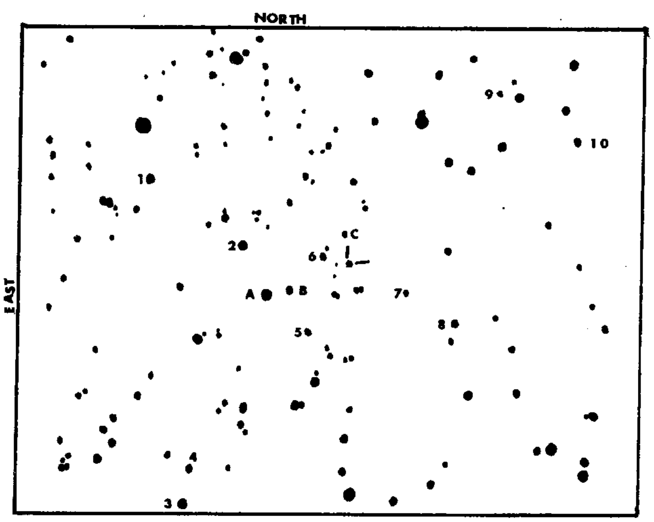


Figure 1. Identification of the stars listed in Table I. Stars labelled A, B, C have photoelectrically determined B magnitudes of 14.98, 13.65, and 16.29 respectively. The object between the tick marks is OI 090.4.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1411

Konkoly Observatory
Budapest
1978 April 5

UBV OBSERVATIONS OF HR 1099 ON FEBRUARY 22nd, 1977

Alerted by telephone calls from D. Fraquelli (University of Toronto) and D.S. Hall (Vanderbilt University) that a radio flare was in progress, we observed HR 1099 in optical wavelengths at the first opportunity with the 41-cm telescope at the RAO. The photometer was equipped with a DCO_2-cooled, selected EMI 6256 PMT operated at - 1200V. Although the night was not of the highest quality and no night extinction and transformation coefficients were obtainable, mean coefficients appear to satisfy the observations adequately. The (Hardie) coefficients employed were: $k_y' = 0.156$, $k_{by}' = 0.098$, $k_{ub}' = 0.271$, $k_y'' = 0.00$, $k_{by}'' = -0.03$, $k_{vb}'' = 0.00$, $\varepsilon = -0.026$, $\mu = 1.002$, $\psi = 1.004$. HR 1099 and its visual companion were observed together using a 30 arc-sec diaphragm.

Differential observations relative to the comparison star, 10 Tau, are given in Table I. Phases were computed using the ephemeris of Bopp et al. (1977).

TABLE I - DIFFERENTIAL OBSERVATIONS OF HR 1099

$JD_{\odot}$	ϕ	dV	d(B-V)	d(U-B)	ΔX	X
2443561 +						
0.6486	278.7346	1.55	0.38	0.39	-0.007	2.018
0.6621	.7394	1.59	0.33	0.43	-0.007	2.086
0.6663	.7408	1.57	0.33	0.44	-0.007	2.144
0.6757	.7442	1.57	0.35	0.42	-0.008	2.277
0.6809	.7460	1.58	0.32	0.44	-0.008	2.376
0.6897	.7491	1.53	0.36	0.42	-0.009	2.515
0.6946	.7508	1.51	0.39	0.40	-0.009	2.616

X is the air mass of the variable star and ΔX is the difference in air mass between the variable and comparison stars at the instant of the variable star observations. The mean standard errors of five comparison star observations were found to be ± 0.019, ± 0.009, and ± 0.010 in V, (B-V), and (U-B) respectively.

The results appear to be fainter than those reported by Bopp et al (1977) for the same phase, but a secular variation of the phase is suspected; the results are in fact consistent with Bopp et al's minimum-light data. In light of the reports that HR 1099 is an x-ray variable (Walter, Charles and Bowyer: 1978) and has been producing very high intensity ratio levels (Feldman, et al, 1978 and Feldman, 1978) observations at all wavelengths are evidently desirable.

E.F. MILONE
R.M. ROBB
Rothney Astrophysical Observatory
The University of Calgary
Canada

References:

Bopp, B.W., Espenak, F., Hall, D.S., Landis, H.J., Lovell, L.P. and Reucroft, S: 1977, Astron. J. 82,47.

Feldman, P.A., Gregory, P.C., Taylor, A.R., and Seaquist, E.R.: 1978, IAU Circ. 3176.

Feldman, P.A.: 1978, IAU Circ. 3180.

Walter, F., Charles, P., and Bowyer, S.: 1978, IAU Circ. 3173.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1412

Konkoly Observatory
Budapest
1978 April 19

CONFIRMATION OF THE δ Sct-TYPE VARIABILITY OF θ^2 TAURI

Recently Horan (1977) announced that θ^2 Tau (= HR 1412) is a δ Sct variable with an amplitude of $0^m_.03$ and a period of 0.07 days, on the basis of a three-hour V run using θ^1 Tau for comparison. Here we present the results of a six-hour UBV run, using 80 Tau as comparison star. Observations were obtained with the same single channel photometer, attached to the 40 cm Cassegrain telescope on Tortugas Mountain. A dry ice cooled 1P21 multiplier was used, the signal was fed to a VFC and a counter. For each colour three 10^s integrations were averaged into a single observation, and a sequence CVVC was taken for the derivation of one brightness difference. The instrumental magnitude differences are given in the accompanying table and figure. The variability discovered by Horan was found to exist at all wavelengths ($\Delta u = 0^m_.03$:, $\Delta b = 0^m_.02$, $\Delta v = 0^m_.02$). The period was determined to $P = 0.080 \pm 0.002$ days.

H. W. DUERBECK

Observatorium Hoher List
der Universitäts-Sternwarte Bonn
5568 Daun/Eifel, F.R.G.

and

Department of Astronomy
New Mexico State University
Las Cruces, NM 88001, U.S.A.

Reference :

Horan, S. 1977, Inf. Bull. Var. Stars 1232

Table 1. Magnitude differences (variable - comparison)

J.D.hel. (2 443 483+)	ΔU	ΔB	ΔV	J.D.hel. (2 443 483+)	ΔU	ΔB	ΔV
.6746	-2.217	-2.288	-2.157	.8138	-2.252	-2.314	-2.183
.6906	-2.274	-2.310	-2.172	.8253	-2.224	-2.296	-2.174
.7048	-2.275	-2.316	-2.185	.8357	-2.225	-2.294	-2.166
.7197	-2.255	-2.314	-2.176	.8461	-2.227	-2.301	-2.169
.7308	-2.241	-2.311	-2.174	.8565	-2.232	-2.303	-2.176
.7427	-2.215	-2.298	-2.161	.8670	-2.245	-2.313	-2.180
.7538	-2.221	-2.294	-2.164	.8774	-2.244	-2.306	-2.179
.7701	-2.257	-2.306	-2.173	.8871	-2.252	-2.311	-2.180
.7808	-2.251	-2.311	-2.184	.8969	-2.245	-2.298	-2.168
.8017	-2.257	-2.309	-2.184	.9086	-2.236	-2.293	-2.165

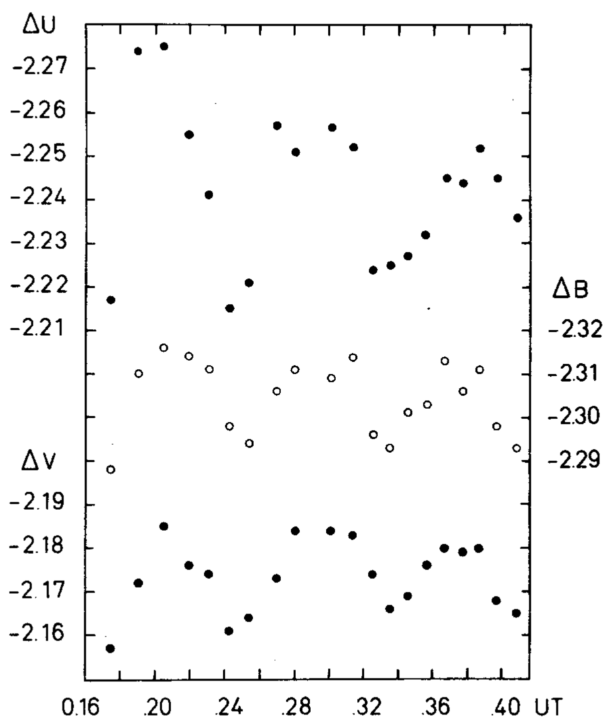


Figure 1.

Brightness differences of θ^2 Tau relative to 80 Tau on 1977 December 6 (UT)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1413

Konkoly Observatory
Budapest
1978 April 19

PHOTOELECTRIC MINIMA AND LIGHT CURVES OF THE ECLIPSING VARIABLE DO CASSIOPEIAE

The variability of DO Cas (BD +59°529, HD 16506) was discovered by Hoffmeister (1947). Photoelectric light curves were obtained by Schneller and Daene (1952), Winkler (1966) and Gleim and Winkler (1969), Cester (1977). Mannino (1958) obtained spectroscopic elements. The photographic magnitude of the star varies from $8^{m}.60$ to $9^{m}.25$. DO Cas was classified as a typical β Lyr type eclipsing variable by Hoffmeister (1947). The light elements were obtained by him as follow:

Hel Min J.D. 2428 865.450 + $0^{d}.684655 \cdot E$.

Photoelectric observations of DO Cas in B,V colours were made with the 48 cm Cassegrain telescope at the Ege University Observatory on 5 nights between September 1977 and January 1978. The photometer was furnished with a 1P21 photomultiplier tube and standard Johnson B,V filters. In the observations BD +59°548 was used as comparison star. 5 primary minima were obtained and are given in the following Table.

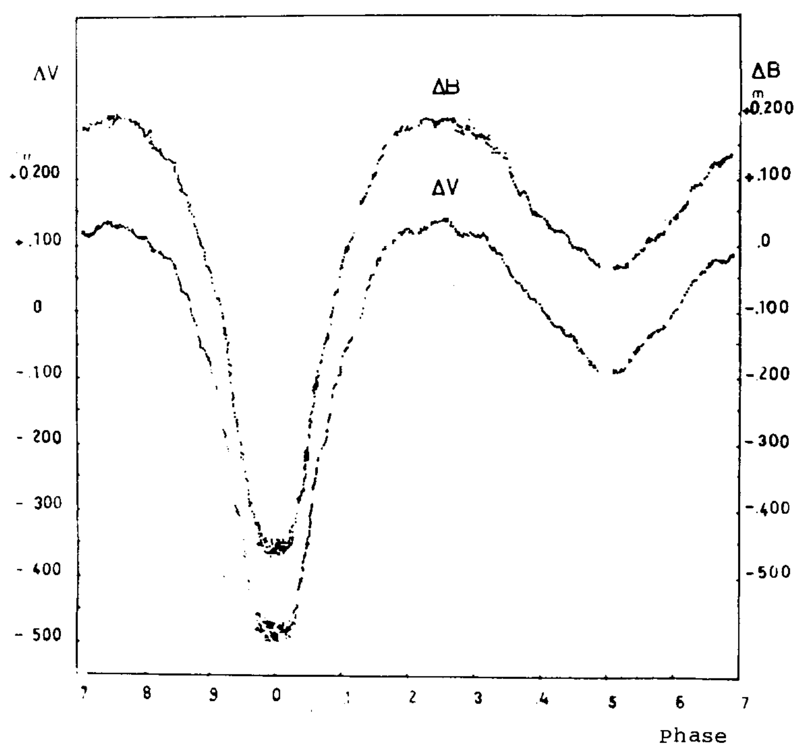
Times of Minima

Hel Min	Min	$(O-C)_I$	$(O-C)_{II}$	$(O-C)_{III}$	n	Fil
2443 408.3972	I	-0.0041	+0.0011	-0.0009	32	b
425.5148	I	-0.0032	+0.0021	0	24	v
.5155	I	-0.0025	+0.0028	+0.0007	24	b
501.5126	I	-0.0035	+0.0020	-0.0001	62	B,V
502.1960	I	-0.0047	+0.0008	-0.0014	26	V
.1967	I	-0.0040	+0.0015	-0.0007	26	B
512.4677	I	-0.0030	+0.0024	+0.0003	47	B,V

$(O-C)_I$ values GCVS 1974., $(O-C)_{II}$ values SAC 1977., $(O-C)_{III}$ values were obtained with the elements of Cester (1977).

Hel Min J.D. 2433 926.4573 + $0^{d}.6846661 \cdot E$.

The light curve is shown in the Figure where the individual magnitude differences between the variable and the comparison star BD +59°548 have been plotted against the phases which were calculated with the elements given by Cester.



OKAN TÜMER

Ege University Observatory
P.K.21 Bornova-Izmir,Turkey

References:

1. Cester,B.,Ciuricin,G.,Mardirossian, F. and Pucillo 1977,Astron. Astrophys. Suppl.30, 223
2. Chambliss, C.R. 1970, Astron.J. 75, 731
3. Glein, J.K. and Winkler, L. 1969, Astron.J. 74, 1191
4. Kwee, K.K. and Woerden, H. van 1956,Bull.Astron.Inst.Neth.12,327
5. Mannino,G.,1958,Mem.Soc.Astron.Ital. 29, 433
6. Schneller, H. and Daene, H. von, 1952, Astron.Nachr. 281, 25
7. Winkler, L., 1966, Astron.J. 71, 40

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1414

Konkoly Observatory
Budapest
1978 April 21

63rd NAME – LIST OF VARIABLE STARS

The present 63rd Name–list of variable stars has been compiled in accordance with the rules established in the 56th list. It contains all necessary identifications for 313 new variables designated in 1976.

The whole number of the designated variable stars is now 27196.

In the square brackets the reference number is given for the work where (not always firstly) the information on discovery of the variable had been published. This reference number accompanies designation or number of the star given for it in the cited work. Name of the discoverer is mentioned only in the cases when it does not coincide with the name of the author of the cited work.

Reference numbers 0001–5216 correspond to the numbers from literature list published in the first volume of the 3rd edition of General Catalogue of Variable Stars (pages A42–A121). The numbers 5217–5824 correspond to the supplementary list published in the First supplement to the Catalogue (pages 279–289). The numbers 5825–6828 correspond to the supplementary list published in the Second supplement to the Catalogue (pages 361–380). The numbers 6829–7733 correspond to the supplementary list published in the Third supplement to the Catalogue (pages 342–357). The numbers 7734–7894 had been published in the 62nd Name–list (IBVS No. 1248, 1976). At last the numbers 7895–7979 are given in the present edition.

We are grateful to *I.E.Filimonova* for preparation of the Name–list for the print.

P.N.Kholopov, N.P.Kukarkina, N.B.Perova

Astronomical Council of the USSR Academy of Sciences, Sternberg State Astronomical Institute

Moscow, December, 1977

KU And = CIT-1 [7895] = IRC+40004.
MW Aps = HV 8699 [4453] = 260.1933 = = BV 1429 [6031] = P 999 = = КЗП 2305.
EY Aqr = HV 9721 [4579] = 822.1936 = = P 5553 = КЗП 5379.
EZ Aqr = L 789-6 = Gl 866 [6873].
o Aqr = 31 Aqr = HR 8402 [4970, 7898] = = BD-2°5681 (5.3) = HD 209409 (B5p) [7899] = SAO 145837 = = КЗП 8738.
V1331 Aql = BD-1°3553 (8.2) [7978] = HD 173198 (B3) [7901] = Zi 1497 = КЗП 101756.
V1332 Aql = BV 1638 [7594].
V766 Ara = HV 8918 [4725] = 789.1935 [4001] = P 4090 = КЗП 2752.
V767 Ara = HV 8937 [4725] = 791.1935 [4001] = P 4112 = КЗП 2784.
V768 Ara = HV 8941 [4487] = 449.1935 [4001, 4194] = P 4117 = = КЗП 2789.
V769 Ara = HV 8943 [4487] = 451.1935 [4001, 4194] = P 4120 = = КЗП 2791.
V770 Ara = HV 8961 [4487] = 463.1935 [4001, 4194] = P 4145 = = КЗП 2824.
V771 Ara = HV 8963 [4488] = 495.1933 [4001] = BV 1283 [5834] = = P 1127 = КЗП 2826.
V772 Ara = HV 8966 [4488] = 496.1933 [4001] = P 1129 = КЗП 2831.
V773 Ara = HV 8967 [4487] = 465.1935 [4001, 4194] = P 4153 = = КЗП 2833.
V774 Ara = HV 8971 [4488] = 497.1933 [4001] = P 1131 = КЗП 2837.
V775 Ara = HV 8975 [4487] = 468.1935 [4001, 4194] = P 4157 = = КЗП 2848.
V776 Ara = HV 8976 [4487] = 469.1935 [4001, 4194] = P 4158 = = КЗП 2849.
V777 Ara = HV 8982 [4487] = 472.1935 [4001, 4194] = P 4166 = = КЗП 2860.
V778 Ara = HV 8986 [4487] = 475.1935 [4001, 4194] = P 4173 = = КЗП 2868.
V779 Ara = HV 8989 [4487] = 477.1935 [4001, 4194] = P 4178 = = КЗП 2874.
V780 Ara = HV 9009 [4487] = 483.1935 [4194] = P 4201 = КЗП 2925.
V781 Ara = S 6069 [4001] = КЗП 7580.
V782 Ara = HV 9018 [4487] = 487.1935 [4001, 4194] = P 4214 = = КЗП 2957.
V783 Ara = S 6089 [4001] = КЗП 7591.
V784 Ara = HV 9020 [4487] = 488.1935 [4001, 4194] = P 4216 = = КЗП 2961.
V785 Ara = S 6099 [4001] = КЗП 7597.
V786 Ara = S 6105 [4001] = КЗП 7599.
V787 Ara = S 6104 [4001] = КЗП 7600.
V788 Ara = S 6106 [4001] = КЗП 7601.
V789 Ara = S 6102 [4001] = КЗП 7602.
V 790 Ara = S 6125 [4001] = КЗП 7613.
V791 Ara = HV 7671 [1021] = 230.1937 = S 6128 [4001] = КЗП 3029.
V792 Ara = S 6131 [4001] = КЗП 7615.
V793 Ara = HV 9038 [4488] = 517.1933 [4001] = P 1225 = КЗП 3063.
V794 Ara = HV 7679 [1021] = 238.1937 = = S 6153 [4001] = КЗП 3065 = = КЗП 7627.
V795 Ara = S 6159 [4001] = КЗП 7632.
V796 Ara = S 6166 [4001] = КЗП 7641.
V797 Ara = HV 9056 [4487] = 514.1935 [4194] = BV 1436 [6031] = = P 4306 = КЗП 3151.
V798 Ara = HV 9062 [4487] = 518.1935 [4194] = BV 1438 [6031] = = P 4318 = КЗП 3193.
QZ Aur = Nova Aur 1964 [7909].
V335 Aur = СПЗ 2184 [7910].
CI Boo = BD+30°2513 (6.5) [4575] = = HD 126009 (Mb) = DO 14941 (M6) = SAO 083312 = IRC +30254 = BV 333 [4014] = = КЗП 7128.
CK Boo = BD+9°2916 (9.0) = HD 128141 (F8) [7911] = SAO 120544.

BK Cam = HR 985 = BD+65°340 (4.5) [4993] = HD 20336 (B3p) [7914] = SAO 012704 = MWC 65 = Zi 180 = КЗП 100264.

BL Cam = GD 428 [7916, 7917].

GZ CMa = BD−16°1860 (8.0) = HD 56429 (A0) = SAO 152646 (8.2) = BV 1621 [7446].

AN Cap = S 5109 [4455] = BV 974 [7776] = КЗП 5193.

V363 Car = HV 8231 [4618] = 226.1934 = = P 3367 = КЗП 1530.

V364 Car = HR 4185 [7977] = CoD −64°485 (6.0) = CPD −64°1403 (5.7) = HD 92664 (A0p) = SAO 251059.

V365 Car = Nova Car 1948 = He 3−558 [7918]. Near NGC 3532 cluster.

V568 Cas = 631.1936 [5177] = P 2507 = = КЗП 131.

V569 Cas = 13 [7920]. In NGC 7635 region.

V570 Cas = 14 [7920]. In NGC 7635 region.

V571 Cas = 16 [7920]. In NGC 7635 region.

V572 Cas = 17 [7920]. In NGC 7635 region.

V573 Cas = 18 [7920]. In NGC 7635 region.

V574 Cas = 19 [7920]. In NGC 7635 region.

V575 Cas = 20 [7920]. In NGC 7635 region.

V576 Cas = 21 [7920]. In NGC 7635 region.

V577 Cas = 22 [7920]. In NGC 7635 region.

V578 Cas = 23 [7920]. In NGC 7635 region.

V579 Cas = 24 [7920]. In NGC 7635 region.

V580 Cas = 32 [7920]. In NGC 7635 region.

V581 Cas = 25 [7920]. In NGC 7635 region.

V582 Cas = IRC+60409 = 31 [7920] In NGC 7635 region.

V583 Cas = 26 [7920]. In NGC 7635 region.

V584 Cas = 27 [7920]. In NGC 7635 region.

V585 Cas = 28 [7920]. In NGC 7635 region.

V586 Cas = 30 [7920]. In NGC 7635 region.

V587 Cas = 29 [7920]. In NGC 7635 region.

V801 Cen = CoD−61°3203 (8.7) = CPD −61°2636 (8.9) = HD 102567 (B0) [7928] = SAO 251595.

V802 Cen = CoD−36°8111 (9.7) = BV 840 [5201].

V803 Cen = $13^h20^m50^s$−41°28′56″, 1950 [7933].

V804 Cen = BV 1172 [7842].

V805 Cen = CoD−53°5256 (9.6) = CPD −53°5703 (9.2) = HD 118547 (B9) = BV 1048 [5845].

V806 Cen = 2 Cen = g Cen = HR 5192 [4583, 5022, 7898] = CoD −33°9358 (4.6) = CPD −33°3506 (6.2) = HD 120323 (Mb) = SAO 204875 = Zi 1025 = КЗП 101407.

V807 Cen = CoD−60°5190 (9.3) = CPD −60°5353 (8.6) = HD 126004 (B5) [7934].

PV Cep = $20^h45^m30^s$+67°47′, 1950 [7935, 7936].

PW Cep = 3 [4310] = КЗП 8614. In NGC 7023 region.

PX Cep = GR 31 [2786] = КЗП 8672.

PY Cep = Ross 90 [4436] = 25 [7881] = = P 2313 = КЗП 5485.

PZ Cep = 1 [7920]. In NGC 7635 region.

QQ Cep = 2 [7920]. In NGC 7635 region

QR Cep = 4 [7920]. In NGC 7635 region.

QS Cep = 6 [7920]. In NGC 7635 region.

QT Cep = 7 [7920]. In NGC 7635 region.

QU Cep = 8 [7920]. In NGC 7635 region.

QV Cep = 9 [7920]. In NGC 7635 reguon.

QW Cep = 10 [7920]. In NGC 7635 region.

QX Cep = 11 [7920]. In NGC 7635 region.

QY Cep = 12 [7920] In NGC 7635 region.

QZ Cep = BV 324 [4015, correction in 7937] = КЗП 8871.

GY Com = $12^h14^m23^s+29°00'.4$, 1900 [7938].

GZ Com = $12^h19^m08^s.8+28°31'48''$, 1950 [7939].

V688 CrA = HV 9519 [4725] = 936.1935 [4001] = P 4857 = КЗП 4334.

V689 CrA = HV 9535 [4725] = 941.1935 [4001] = P 4886 = КЗП 4378.

V690 CrA = 1.1932 [7940] = P 1707 = = КЗП 4468.

SY Crv = СПЗ 2186 [7941].

SZ Crv = СПЗ 2187 [7941].

SX Crt = СПЗ 2162 [7942, *Нурманова*].

BN Cru = HV 8451 = 100.1932 [4454] = = P 836 = КЗП 1889.

V1579 Cyg = BD+55°2248 (8.9) = HD 186715 (Mb) = DO 37771 (M6) = SAO 031921 = IRC +60270 = BV 393 [4654] = = КЗП 8275.

V1580 Cyg = $19^h41^m04^s+45°13'.0$, 1900 [7943, *Clark*].

V1581 Cyg = G 208–44/45 [7944].

V1582 Cyg = BD+42°3543 (9.0) [7945] = = HD 189348 (K2) = SAO 049029.

V1583 Cyg = IRC+30408 = DO 18490 (M4) = 983.1935 [4758] = P 5229 = КЗП 4995.

V1584 Cyg = HR 7786 = BD+46°2910 (6.5) = HD 193722 (B9) [7946] = SAO 049482.

V1585 Cyg = СПЗ 2132 [7947].

V1586 Cyg = B 28 [7948] = СПЗ 2233.

V1587 Cyg = B 32 [7948] = СПЗ 2237.

V1588 Cyg = B 40 [7948] = СПЗ 2245.

V1589 Cyg = B 19 [7948] = СПЗ 2224.

V1590 Cyg = B 35 [7948] = СПЗ 2240.

V1591 Cyg = B 38 [7948] = СПЗ 2243.

V1592 Cyg = B 27 [7948] = СПЗ 2232.

V1593 Cyg = B 34 [7948] = СПЗ 2239.

V1594 Cyg = B 39 [7948] = СПЗ 2244.

V1595 Cyg = B 10 [7753] = СПЗ 2216.

V1596 Cyg = B 36 [7948] = СПЗ 2241.

V1597 Cyg = B 9 [7753] = СПЗ 2215.

V1598 Cyg = B 14 [7498] = СПЗ 2219.

V1599 Cyg = B 22 [7948] = СПЗ 2227.

V1600 Cyg = B 25 [7948] = СПЗ 2230.

V1601 Cyg = B 31 [7948] = СПЗ 2236.

V1602 Cyg = B 33 [7948] = СПЗ 2238.

V1603 Cyg = B 26 [7948] = СПЗ 2231.

V1604 Cyg = B 18 [7948] = СПЗ 2223.

V1605 Cyg = B 30 [7948] = СПЗ 2235.

V1606 Cyg = B 37 [7948] = СПЗ 2242.

V1607 Cyg = B 24 [7948] = СПЗ 2229.

V1608 Cyg = B 17 [7948] = СПЗ 2222.

V1609 Cyg = B 29 [7948] = СПЗ 2234.

V1610 Cyg = IV Zw 67 [7949] = CRL 2688 = СПЗ 2255. In the Egg Nebula.

V1611 Cyg = B 20 [7948] = СПЗ 2225.

V1612 Cyg = B 21 [7948] = СПЗ 2226.

V1613 Cyg = B 23 [7948] = СПЗ 2228.

V1614 Cyg = СПЗ 2189 [7950, *Шугаров*].

V1615 Cyg = СПЗ 2190 [7951, *Шугаров*].

V1616 Cyg = СПЗ 2157 [7952, *Шугаров*].

V1617 Cyg = BD+51°3117 (9.5) = IRC +50389 = DO 39931 (R) = = 660.1936 [5177] = P 5622 = = КЗП 5461.

V1618 Cyg = СПЗ 2156 [7952, *Шугаров*].

V1619 Cyg = HR 8349 = BD+38°4621 (6.5) = HD 207857 (B9) [7851, 7953, 7955] = SAO 071767.

V1620 Cyg = СПЗ 2199 [7954, *Шугаров*].

CZ Dra = $18^h23^m.8+50°54'$, 1900 [7956, 7957] = СПЗ 2204.

DD Dra = BV 234 [4007] = КЗП 7949.

DE Dra = 71 Dra [7958] = HR 7792 = BD +61°2000 (5.8) = HD 193964 (B9) = SAO 018807. = S 10796.

DF Dra = GR 79 [4297] = КЗП 8561.

ϰ Dra [2890, 7900] = 5 Dra = HR 4787 = = BD+70°703 (3.3) = = HD 109387 (B5p) = = SAO 007593 = Zi 947 = КЗП 101294.

λ Eri [7962] = 69 Eri = HR 1679 [7845] = BD−8°1040 (4.2) = HD 33328 (B2) [2602] = SAO 131824 = = Zi 352 = КЗП 100453.

ω Gem [7963] = 42 Gem = HR 2630 [7964] = BD+24°1502 (5.8) = HD 52497 (K0) = = SAO 078999 = IRC +20165 = P 421 = КЗП 100792.
AZ Gru = S 6493 [4001] = КЗП 8772.
BB Gru = S 6495 [4001] = КЗП 8782.
BC Gru = S 6498 [4001] = КЗП 8788.
BD Gru = S 6501 [4001] = КЗП 8790.
V673 Her = S 9882 [3903].
V674 Her = S 9631 [3905].
V675 Her = S 9883 [3903].
V676 Her = S 9632 [3905].
VY Hor = BPM 31594 [7965].
KT Hya = OV 30 [7966, *Whithey*].
KU Hya = HR 3724 = BD−9°2816 (6.8) = = HD 81009 (A2) [7953, 7977] = SAO 136799 = ADS 7334.
KV Hya = СПЗ 2188 [7941].
β Hya = HR 4552 [4456, 4457, 7968] = = CoD−33°8018 (4.5) = CPD −33°3159 (5.2) = HD 103192 (B9) = SAO 202901 = КЗП 6875.
BB Ind = CoD−47°13487 (9.9) = HD 196434 (Mb) = HV 3340 [7969] = = 76.1911 = BV 1401 [5937] = = Zi 1924 = КЗП 5229.
V357 Lac = BD+51°3341 (7.5) [7970, *Kron*] = HD 212044 (B2p) = = 24.1938 = КЗП 5543.
V358 Lac = GR 70 [4321] = КЗП 8794.
ρ Leo [7971] = 47 Leo = HR 4133 [7884, 7967] = BD +10°2166 (4.1) = HD 91316 (B0p) [7972] = = SAO 118355 = КЗП 101135.
GS Lib = c^1 Lib [7973].
GT Lib = HV 8779 = 57.1914 [7974, 4579] = Zi 1152 = КЗП 2434.
GU Lib = HV 8781 [4579] = 878.1936 [4001, 4579] = P 3961 = КЗП 2436.
GV Lib = HV 10755 [5189] = BV 1676 [7897] = КЗП 2493.
GZ Lup = HV 11586 [1869, 4001] = = КЗП 2309.
HH Lup = HV 8747 [2589] = 405.1935 [4194] = BV 1241 [5829] = P 3934 = КЗП 2379.
HI Lup = BV 1606 [7762].
HK Lup = No. 4 [7923].
V462 Lyr = S 9634 [3905].
V463 Lyr = S 9314 [3910].
V464 Lyr = S 9316 [3910].
V465 Lyr = S 9888 [3903].
WY Men = No.1 [7975]. Near globular cluster NGC 1841. Probably not a member of the cluster.
WZ Men = No.14 [7975]. Near globular cluster NGC 1841. Probably not a member of the cluster.
XX Men = No.15 [7975]. Near globular cluster NGC 1841. Probably not a member of the cluster.
ι Men = HR 1991 [7976] = CoD −78°216 (5.9) = CPD −78°195 (6.2) = HD 38602 (B9) = SAO 256214.
AW Mic = CoD−34°14977 (8.5) = CPD −34°8906 (8.4) = HD 202759 (B9) [7896] = SAO 212896.
V634 Mon = 108.1936 [0796] = P 3008 = КЗП 1005.
V635 Mon = BD−8°2186 (7.2) = HD 66094/5 (F5/A2) = SAO 135392 = BV 1594 [7762].
QR Nor = HV 8848 [4725] = 767.1935 = = P 4012 = КЗП 2591.
QS Nor = HV 8869 [4725] = 776.1935 = = P 4027 = КЗП 2635.
QT Nor = HV 8903 [4725] = 787.1935 [4001] = P 4068 = КЗП 2724.
BZ Oct = HV 8738 [4454] = BV 955 [7776] = 105.1932 = P 1009 = = КЗП 2359.
V2095 Oph = BV 1683 [7897].
V2096 Oph = HV 3911 [5571] = 45.1937 [4707] = P 1135 = КЗП 2852.
V2097 Oph = HV 3914 [5571] = = 50.1937 [4707] = P 1146 = КЗП 2877.
V2098 Oph = HV 3918 [5571] = 51.1937 [4707] = P 1154 = КЗП 2895.

V2099 Oph = HV 9003 [4707] = BV 1685 [7897] = 53.1937 = P 4199 = = КЗП 2907.
V2100 Oph = HV 3926 [5571] = BV 1686 [7897] = P 1169 = КЗП 2926.
V2101 Oph = HV 3941 [5571] = BV 1694 [7897] = P 1199 = КЗП 2979.
V2102 Oph = HV 3943 [5571] = P 1204 = = КЗП 2990.
V2103 Oph = СПЗ 456 [4931] = P 4328 = = КЗП 3218.
V2104 Oph = Nova Oph 1976 = $18^h00^m.9$ + 11°48′ (1950.0) [7902].
V1027 Ori = BD+14°1188 (9.5) = HD 253191 (G5) = 289.1934 [4289] = P 2809 = КЗП 721.
V1028 Ori = BD+10°1104 (9.2) = HD 255930 (B5) [7903].
V339 Pav = HV 9604 [4487] = 588.1935 [4001, 4194] = P 4986 = КЗП 4561.
V340 Pav = S 7137 [4001] = BV 1299 [5834] = КЗП 8142.
V341 Pav = HV 9694 = 139.1932 [4454] = = BV 1304 [5834] = P 2103 = = КЗП 5135.
HV Peg = 69 Peg = HR 8915 = = BD+24°4778 (6.5) = HD 220933 (A0) [7851] = SAO 091278.
HW Peg = 71 Peg = HR 8940 [1371] = BD +21°4952 (6.0) = HD 221615 (Mb) = SAO 091340 = DO 22297 (M6) = IRC+20550 = P 2403 = КЗП 5749.
HX Peg = PG 2337+12 [7904, *Green*].
V423 Per = HR 976 [4170] = BD+34°610 (6.5) = HD 20210 (A2) = = SAO 056296 = КЗП 6018.
OU Pup = L_1 Pup [5859] = HR 2746 [7968] = CoD−44°3223 (5.3) = = CPD−44°1347 (5.8) = HD 56022 (A0p) = SAO 218546 = = Zi 614 = КЗП 100838.
OV Pup = HV 3878 [5192] = Zi 642 = = КЗП 1084.
OW Pup = z Pup = HR 2911 [5182, 4588, 4456] = CoD−36°3715 (6.0) = = CPD−36°1372 (5.2) = HD 60606 (B5p) = SAO 198130 = = КЗП 6590.
OX Pup = HR 3032 [7977] = CoD −39°3595 (6.9) = CPD −39°1666 (6.8) = HD 63401 (B9) = SAO 198435.
OY Pup = HV 8109 [4487] = 248.1935 [4194] = P 3118 = КЗП 1218.
OZ Pup = 689.1935 [5028] = HV 8127 [4579] = P 3165 = КЗП 1286.
UZ Pyx = CoD−29°6735 (7.9) = CPD −29°2801 (8.5) = HD 75021 (R8) [6059, 7845] = SAO 176458 = IRC−30134.
HS Sge = Nova Sge 1977 = $19^h37^m.1$ +18°02′ (1950) [7905].
V3964 Sgr = Nova Sgr 1975 No. 2 = = $17^h46^m.2$−17°22′.2 (1950) [7906].
V3965 Sgr = 67 (Sgr I) [7907].
V3966 Sgr = 7 (Sgr I) [7907].
V3967 Sgr = 150 (Sgr I) [7907].
V3968 Sgr = 47 (Sgr I) [7907].
V3969 Sgr = 88 (Sgr I) [7907].
V3970 Sgr = 95 (Sgr I) [7907].
V3971 Sgr = 33 (Sgr I) [7907].
V3972 Sgr = 65 (Sgr I) [7907].
V3973 Sgr = 124 (Sgr I) [7907].
V3974 Sgr = 4 (Sgr I) [7907].
V3975 Sgr = 79 (Sgr I) [7907].
V3976 Sgr = 53 (Sgr I) [7907].
V3977 Sgr = 87 (Sgr I) [7907].
V3978 Sgr = 39 (Sgr I) [7907].
V3979 Sgr = 55 (Sgr I) [7907].
V3980 Sgr = 74 (Sgr I) [7907].
V3981 Sgr = 24 (Sgr I) [7907].
V3982 Sgr = 100 (Sgr I) [7907].
V3983 Sgr = 119 (Sgr I) [7907].
V3984 Sgr = CoD−33°12700 (7.4) = CPD −33°4751 (7.8) = HD 163868 (B3) [7908] = SAO 209569.
V3985 Sgr = 17 (Sgr I) [7907].
V3986 Sgr = 10 (Sgr I) [7907].
V3987 Sgr = 11 (Sgr I) [7907].
V3988 Sgr = 25 (Sgr I) [7907].

V3989 Sgr = 1 (Sgr I) [7907].
V3990 Sgr = 81 (Sgr I) [7907].
V3991 Sgr = 45 (Sgr I) [7907].
V3992 Sgr = 61 (Sgr I) [7907].
V3993 Sgr = 37 (Sgr I) [7907].
V3994 Sgr = 102 (Sgr I) [7907].
V3995 Sgr = 117 (Sgr I) [7907].
V3996 Sgr = 133 (Sgr I) [7907].
V3997 Sgr = 129 (Sgr I) [7907].
V3998 Sgr = A 28 (NGC 6522 field). [7907].
V3999 Sgr = 205 (NGC 6522 field) [7907].
V4000 Sgr = 435 (NGC 6522 field) [7907].
V4001 Sgr = 426 (NGC 6522 field) [7907].
V4002 Sgr = 238 (NGC 6522 field) [7907].
V4003 Sgr = D 1 (NGC 6522 field) [7907].
V4004 Sgr = 791 (NGC 6522 field) [7907].
V4005 Sgr = D 3 (NGC 6522 field) [7907].
V4006 Sgr = JL–1 [7912].
V4007 Sgr = 26 (Sgr II) [7907].
V4008 Sgr = 14 (Sgr II) [7907].
V4009 Sgr = 29 (Sgr II) [7907].
V4010 Sgr = 23 (Sgr II) [7907].
V4011 Sgr = 13 (Sgr II) [7907].
V4012 Sgr = 1 (Sgr II) [7907].
V4013 Sgr = 60 [3909] = 25 (Sgr II) [7907].
V4014 Sgr = 17 (Sgr II) [7907].
V4015 Sgr = 11 (Sgr II) [7907].
V4016 Sgr = Var 1 [7913].
V4017 Sgr = 1 [7087].
V4018 Sgr = JL–2 [7912].
V4019 Sgr = $18^h18^m49^s$–25°37′ (1900) [7915, *Owensky*]. Coordinates are wrong. True coordinates are: $18^h19^m18^s$ –25°43′ (1900).
V4020 Sgr = $18^h21^m05^s$–16°50′.2 (1900) [7591, *Dinerstein*].
V4021 Sgr = Nova Sgr 1977 = $18^h35^m.2$ –23°23′ (1950) [7919].
V4022 Sgr = 15 [7087].

V4023 Sgr = Var. 2 [7913].
V4024 Sgr = HR 7249 = BD–19°5312 (6.0) = CPD–19°7309 (5.1) = = HD 178175 (B3) [7921, 6311] = SAO 162229.
V4025 Sgr = BV 1714 [7922].
V4026 Sgr = BD–17°5746 (7.0) = HD 186780 (Ma) [6323] = SAO 162980 = IRC–20574 = КЗП 8280.
V908 Sco = 6 [7923].
V909 Sco = HV 8905 [4487] = 429.1935 [4194] = BV 1680 [7897] = P 4075 = КЗП 2727.
V910 Sco = HV 8910 [4487] = 431.1935 [4194] = P 4081 = КЗП 2739.
V911 Sco = CoD–40°10841 (8.3) = CPD –40°7554 (9.4) = HD 151965 (B9) [7924] = SAO 227332.
V912 Sco = HV 8983 [4487] = 473.1935 [4194] = P 4171 = КЗП 2862.
V430 Sct = BD–14°5039 (6.8) = HD 169454 (BO) [7889, *Sterken*; 7925] = SAO 161457.
LU Ser = Ross 34 [5905] = Zi 1343 = = КЗП 3420.
V724 Tau = 56 Tau = HR 1341 = BD +21°623 (5.8) = HD 27309 (A0p) [7926, *Hildebrandt*] = = SAO 076551.
V725 Tau = BD+26°883 (8.9) [7979] = HD 245770 (B0) [7927] = SAO 077348 = S 10795.
V726 Tau = $5^h46^m33^s$+16°16′.5 (1900) [7929].
PQ Tel = HV 9593 [4487] = 582.1935 [4194] = BV 1453 [6031] = P 4971 = КЗП 4529.
KS TrA = HV 8680 [4618] = 178.1934 = = P 3885 = КЗП 2278.
KT TrA = HV 8732 [4618] = 195.1934 = = BV 1272 [5834] = P 3920 = = КЗП 2347.
KU TrA = HV 8744 [4488] = 458.1933 [4001] = P 1015 = КЗП 2371.
KV TrA = HV 8769 [4488] = 466.1933 = = BV 1176 [7842] = P 1029 = = КЗП 2416.

KW TrA = HV 8913 [4488] = 489.1933 [4001] = P 1108 = КЗП 2747.

KX TrA = He 2–177 [7930].

CE Tuc = CoD–65°2919 (9.5) = CPD –65°4140 (9.4) = HD 220997 (Mc) = S 5161 [4455] = BV 1404 [5937] = КЗП 5732.

CY UMa = СПЗ 2198 [7931].

CZ UMa = СПЗ 2193 [7932].

γ UMi [4993] = HR 5735 = BD+72°679 (2.8) = HD 137422 (A2) = SAO 008220 = IRC+70129 = Zi 1129 = КЗП 101502.

HN Vel = HV 8176 [4725] = 716.1935 = P 3265 = КЗП 1405.

HO Vel = HV 8283 [4453] = 140.1933 = P 678 = КЗП 1609.

HP Vel = CoD–51°4956 (8.8) = CPD –51°3499 (9.2) = HD 92681 (Mb) [7871].

HQ Vel = CoD–52°3965 (7.8) = CPD –52°3887 (8.7) = HD 93357 (Ma) [7871] = SAO 238441.

HR Vel = CoD–52°3983 (11) = CPD –52°3915 (10.0) = HD 93629 (Mb) [7871].

HS Vel = HV 8316 [4487] = 278.1935 [4194] = P 3444 = КЗП 1669.

HT Vel = HD 95289 (Mb) [7871].

FY Vir = СПЗ 2197 [7960].

FZ Vir = BD–1°2674 (7.7) = HD 108680 (Ma) [7959] = SAO 138813 = DO 3235 (M5) = IRC 00219.

GG Vir = 27 Vir = HR 4824 [7961] = BD+11°2484 (7.0) = HD 110377 (A5) = КЗП 101316.

NX Vul = GR 56 [5040] = КЗП 8392.

Supplementary Literature List

7895.*Г.В.Хозов, Т.Н.Худякова, Л.В.Ларионова, В.М.Ларионов*, АО ЛГУ труды **33**, 26–37, 1977.

7896.*A.Przybylski, M.S.Bessell*, PASP **86**, 403, 1974.

7897.*W.Strohmeier, R.Knigge*, Bamb Ver **10**, Nr.116, 1975.

7898.Cape Mim No.1, 1953.

7899.*J.Lub, J.W.Pel*, AsAp **54**, 137, 1977.

7900.*A.Kruszewski*, AA **16**, 285, 1966.

7901.*F. van Leeuwen*, IBVS No.1041, 1975.

7902.*Y.Kuwano*,IAU Circ No.2994, 1976.

7903.*D.G.Turner*, IBVS No. 1166, 1976.

7904.IAU Circ No.2892, 1975.

7905.*J.G.Hosty*, IAU Circ No.3025, 1977.

7906.*I.Lundström, B.Stenholm*, IAU Circ No.2997, 1976.

7907.*T.L.Evans*, MN **174**, 169, 1976.

7908.*E.J.Woodward*, IBVS No. 993, 1975.

7909.*N.Sanduleak*, IBVS No.1011, 1975.

7910.*Н.Даубе*, АЦ №935, 1977.

7911.*H.E.Bond*, PASP **87**, 877, 1975.

7912.*J.Lukas*, JAAVSO **4**, No.2, 64, 1975–76.

7913.*D.Hoffleit*, IBVS No.1064, 1975.

7914.*H.F.Haupt, A.Schroll*, AsAp Suppl **15**, 311, 1974.

7915.*M.Brewster*, JAAVSO **4**, No.2, 96, 1975–6.

7916.*R.A.Berg*, BAAS **9**, No.2, 303, 1977.

7917.*R.A.Berg, J.G.Duthie*, ApJ **215**, L25, 1977.

7918.*K.G.Henize, W.Liller*, ApJ **200**, 694, 1975.

7919.*Y.Kuwano*, IAU Circ No. 3055, 1977.

7920.*L.Rosino, A.Bianchini, D.DiMartino*, AsAp Suppl **24**, No.1, 1, 1976.

7921.*J.H.Walraven, J.Tinbergen, Th.Walraven*, BAN **17**, No.7, 520, 1964.

7922.R.Knigge, W.Strohmeier, Bamb Ver **10**, Nr.116, 1975.

7923.*O.J.Eggen*, PASP **87**, 37, 1975.

7924.*R.W.Hilditch*, MN **171**, 25 P, 1975.

7925.*C.Bartolini, S.Scardovi*, IBVS, No.963, 1975.

7926.*A.S.Nikolov*, IBVS No.942, 1974.

7927.*S.Rössiger*, MVS **7**, H.5, 105, 1976.

7928.*B.L.Webster*, MN **169**, 53P, 1974.

7929.*R.Szafraniec*, AA **26**, No. 1, **25**, 1976.

7930.*W.Liller*, ApJ **192**, L 89, 1974.

7931.*В.П.Горанский*, АЦ №955, 1977.

7932.*В.П.Горанский*, АЦ №942, 1977.

7933.*A.Elvius*, AsAp **44**, 117, 1975.

7934.*J.W.Pel*, AsAp Suppl **24**, 413, 1976.

7935.*M.Cohen, L.V.Kuhi, E.A.Harlan*, ApJ **215**, No.3, L127, 1977.

7936.IAU Circ No.3095, 1977.

7937.Bamb Ver **5**, Nr.15, 1962.

7938.*D.Hoffleit*, IBVS No.957, 1975.

7939.*M.P.Véron, P.Véron*, IBVS No.1155, 1976.

7940.*F.Becker*, BZ **14**, 12, 1932.

7941.*В.П.Горанский*, АЦ №943, 1977.

7942.*Т.А.Евстигнеева*, ПЗ, приложение **3**, №15, 289, 1977.

7943.*D.Hoffleit*, MS, February, 1977.

7944.*S.Cristaldi, M.Rodonó*, AsAp **48**, 165, 1976.

7945.*H.Unger*, Sterne und Weltraum, 15, Nr.12, 412, 1976.

7946.*W.Schöneich, G.Hildebrandt, W.Fürtig*, AN **297**, 39, 1975.

7947.*Н.Е.Курочкин*, ПЗ **20**, 325, 1977.

7948.*M.K.Tsvetkov, L.K.Erastova, K.P.Tsvetkova*, IBVS No.1002, 1975.

7949.*Ю.Н.Ефремов, Н.Е.Курочкин*, АЦ №867, 1975.

7950.*О.С.Бартунов*, АЦ №943, 1977.

7951.*С.М.Бычков*, АЦ №940, 1977.

7952.*Е.Н.Пастухова, С.Ю.Шугаров*, АЦ №916, 1976.

7953.*M.Golay*, IAU Symposium No. 54, 275, 1973.

7954.*Т.И.Ткачева*, АЦ №963, 1977.
7955.*K.Panov, W.Schöneich*, AN **297**, 177, 1976.
7956.*Е.Н.Макаренко*, АЦ №877, 1975.
7957.*М.В.Долидзе*, АЦ №856, 1975.
7958.*W.Fürtig*, IBVS No.1071, 1975.
7959.*O.J.Eggen*, Preprint, 1976 (June).
7960.*В.П.Горанский*, АЦ №952, 1977.
7961.*C.Bartolini, A.Piccioni, P.Silveri*, IBVS No.981, 1975.
7962.*Э.А.Витриченко, И.Семенюк*, Изв КрАО **34**, 106, 1965.
7963.*E.A.Fath*, PASP 43, 292, 1931.
7964.*G.Henriksson*, AsAp 54, 309, 1977.
7965.*J.T.Mc Graw*, ApJ 210, L35, 1976.
7966.*O.Chris St. Cyr*, IBVS No.982, 1975.
7967.*A.Gutierrez-Moreno, H.Moreno, J.Stock, C.Torres, H.Wroblewski*, Cerro Tololo Contr No.9, 1966.
7968.*P.Renson, J.Manfroid, A.Heck*, AsAp Suppl **23**, 413, 1976.
7969.*W.P.Fleming*, HC No.167, 1911.
7970.*D.M.Popper*, PASP **50**, 175, 1938.
7971.*P.Guthnick, H.Harting*, Abh Preuss Akad Wiss Nr.1, 1944,
7972.*G.Hill, S.C.Morris, G.A.H.Walker*, AJ **76**, 246, 1971.
7973.*M.Taylor*, JAAVSO 4, No.2, 58, 1975–76.
7974.*C.O.Lampland*, AN **198**, 353, 1914.
7975.*T.D.Kinman, L.L.Stryker, J.E.Hesser*, PASP **88**, 393, 1976.
7976.*S.T.H.Naqvi, B.Grønbech*, AsAp **47**, 315, 1976.
7977.*H.Hensberge, C.De Loore, E.J.Zuiderwijk, G.Hammerschlag-Hensberge*, AsAp **48**, 383, 1976.
7978.*W.Valentiner, AN 112, 299, 1885.*
7979.*W.Liller*, IAU Circ 2780, 1975.

Supplement to the List of Abbreviations

Abh Preuss Akad Wiss – Abhandlungen der Preussischen Akademie der Wissenschaften, Mathematische und naturwissenschaftliche Klasse. Berlin.

Cerro Tololo Contr – Cerro Tololo Inter-American Observatory. Contributions.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1415

Konkoly Observatory
Budapest
1978 April 21

OBSERVATIONS OF UV Pisc AND XY Cet

Observations of the above stars were recently made at the Kottamia station of Helwan Observatory, Egypt (see also IBVS No. 1381). The observations were made during a three-week period in October-November, 1977, and standard stars were observed on a number of nights during the period in order to relate the photometry to the standard UBV system.

Minima have been timed by an optimal curve fitting method – the essential parameter which is involved for this purpose being the small correction $\Delta\theta_0$ to bring the observed phases into correspondence with the theoretical eclipse curves (Budding, 1973), e.g., see Fig. (1).

The details are as follows:

(i) UV Pisc (BD 6° 189) ; Type G5 ; $\alpha = 1^h, 14^m_{\cdot}3$; $\delta = 6°, 33'$ (1950)

Main comparison star (BD 6° 197) ; Type G5; $\alpha = 1^h, 16^m_{\cdot}9$; $\delta = 7°, 14'$ (1950)

UV Pisc: $m_v(\text{max.}) = 9^m_{\cdot}21 \pm 0^m_{\cdot}03$; $m_v(\text{min I}) = 10^m_{\cdot}05 \pm 0^m_{\cdot}03$; $(B-V)_{\text{out of eclipse}} = 0.85 \pm 0^m_{\cdot}02$

Comp. star: $m_v = 8.58 \pm 0^m_{\cdot}03$; $(B-V) = 1.07 \pm 0^m_{\cdot}02$

Time of primary minimum: $HJD_o = 2443463.3493$

(ii) XY Cet. (BD +2° 460) ; Type A0 ; $\alpha = 2^h, 56^m_{\cdot}9$; $\delta = 3°, 19'$ (1950)

Main comparison star (+2° 464) ; Type A3 ; $\alpha = 2^h, 59^m_{\cdot}1$; $\delta = 3°, 21'$

XY Cet: $m_v(\text{max.}) = 8.65 \pm 0.^m02$; $m_v(\text{min I}) = 9.54 \pm 0.^m02$; $(B-V)_{\text{out of eclipse}} = 0.1 \pm 0^m_{\cdot}01$

Comp. star: $m_V = 8.63 \pm 0^m.02$ $(B-V) = 0.19 \pm 0^m.01$

Time of primary minimum: $HJD_o = 2443453.3049$

An almost complete light curve of UV Pisc has been observed (cf. IBVS No. 1381) and both minima of XY Cet have been fairly well covered. More observations for XY Cet are planned for later this year.

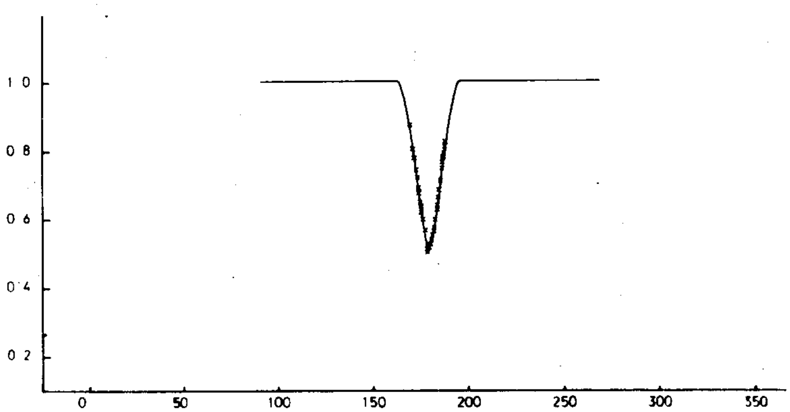


Figure 1. Curve fitting to the primary minimum of XY Cet.

H. AL-NAIMIY, E. BUDDING
D. JASSUR, A.R. SADIK
Dept. of Astronomy
University of Manchester

Reference:

Budding, E., 1973, Astrophys. Space Sci., 22, 87

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1416

Konkoly Observatory
Budapest
1978 April 25

PHOTOELECTRIC MONITORING OF THE FLARE STAR YZ CMi

Continual photoelectric monitoring of the flare star YZ CMi was carried out at the Okayama Station of the Tokyo Astronomical Observatory during the period of 4 to 10 January 1978.

The observations were made with the synchronous three-colour photometer attached to the 91 cm reflector. The observational results are summarized in the Table. The explanation of symbols and detail of the observing equipment can be found in Tokyo Astronomical Bulletin (2nd series) No.222.

Some more details will be published in the same Bulletin.

K. ICHIMURA
Y. SHIMIZU
Tokyo Astronomical Observatory

Flares of YZ CMi observed at Okayama

4 to 10 January, 1978

Date 1978 Jan.	Time of Monitoring (UT)	Filter	Time of Max. (UT)	$\frac{I_{0+f}-I_0}{I_0}$	Max. Δm mag.	P min.	d_b min.	d_a min.	σ mag.
6^d	13^h38^m– 16^h58^m	U	$14^h06^m.5$	8.89	2.49	7.0	0.4	4.6	
		B		1.23	0.87	1.2	0.3	4.6	
		V		0.31	0.29	0.3	0.2	3.0	
		U	15 16.3	0.51	0.45	0.2	0.3	0.8	U 0.15
		B		0.48	0.43	0.1	0.2	0.8	B 0.05
		V		-	-				V 0.02
		U	15 35.2	2.43	1.34	2.5	1.2	5.5	
		B		0.27	0.26	1.3	0.9	4.2	
		V		0.09	0.09	0.1	0.4	0.8	
7	15 38 - 16 01	U	15 47.3	11.40	2.73	15.5	0.2	8.5	0.10
		B		2.37	1.32	3.9	0.2	8.1	0.09
		V		0.34	0.32	1.0	0.2	8.0	0.03
8	12 11 - 16 55	U	13 02.1	2.24	1.28	2.6	0.3	3.4	0.12
		B		0.29	0.28	0.3	0.2	3.2	0.06
		V		0.07	0.07	0.1	0.2	2.0	0.02
		U	13 57.3	4.66	1.88				
		B		0.71	0.58				
		V		0.19	0.19				
		U	13 58.5	3.50	1.63	U 23.5	0.6	13.5	U 0.10
		B		0.47	0.42	B 3.6	0.6	13.3	B 0.05
		V		0.15	0.15	V 1.8	0.6	12.3	V 0.02
		U	14 02.2	5.25	1.99				
		B		0.92	0.71				
		V		0.25	0.24				
9	14 19 - 15 01								
	16 27 - 18 21	U	17 11.2	1.30	0.90	0.6	0.2	1.3	U 0.10
		B		0.27	0.26	0.1	0.1	1.0	B 0.03
		V		0.12	0.12	0.1	0.1	0.7	V 0.02

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1417

Konkoly Observatory
Budapest
1978 May 2

AN APPEAL TO ASTRONOMERS

Who have unpublished or halfpublished discoveries, contributions, observations or thoughtful excogitations and new acquaintances with one of the most remarkable stars RY Sct are asked to kindly and generously send to me. I would like to reinvestigate "de novo" the whole mysterious problem of this variable.

S.I. GAPOSHKIN
Harvard College
Observatory
60 Garden Street
Cambridge, Mass.02138
U.S.A.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1418

Konkoly Observatory
Budapest
1978 May 2

NEW PHOTOELECTRIC MEASURES OF ETA ORIONIS

The meager photometric history of the eclipsing binary η Ori has been described by Chambliss (1978) who also reported a few new photoelectric observations. At the Flower and Cook Observatory η Ori AabcB (using McAlister's (1976) notation) has been observed in yellow and blue as one unresolved source with the semi-automated, 2-channel, pulse counting Pierce-Blitzstein photometer. This multiple system is so bright that a neutral density filter, nominally diminishing the beam by 5 mag., was employed to avoid excessive statistical corrections for pulse coincidences. The simultaneously-observed comparison star was HD 35777 (B2 V), for which a nominal 2.2 mag. neutral filter was used for the same reason. The photometric scale is very closely that of the BV system but the exact neutral attenuations were not measured and the zero point of the (V-C) magnitude differences is not accurately known at this time. The counting interval was 0.0004 day and no check star was observed.

The observations are listed in Table I which also enumerates the number of counts composing an observation, the internal standard deviation of that observation, and its phase calculated from the ephemeris privately provided by E. R. Zizka and W. R. Beardsley:

Hel. Pr. Min. = 2415761.826 + 7.989268 E.

Light time effects in the 9.174 year orbit have been ignored for the calculations of the phases of Table 1. The measures from the table are collected onto one cycle in Figure 1. Because it is known that Strömgren-y observations transform to Johnson, Morgan-V observations without great problems of photometric scale, the y-observations of Chambliss have been translated in zero point to give as small as possible a systematic difference from those of Table 1. These shifted observations also appear in the figure. The b-observations of Chambliss have not been shifted in this fashion and are not plotted.

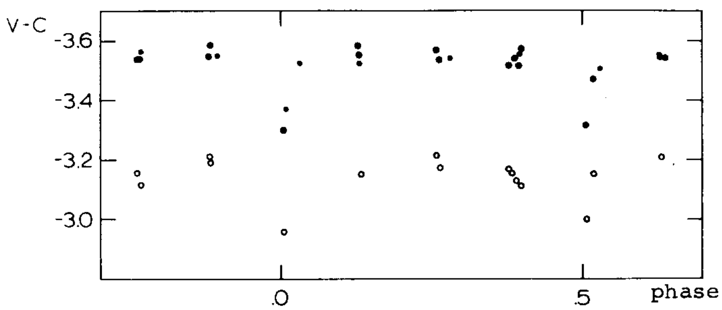


Fig. 1. The light curve of η Ori AabcB defined by the present yellow (large filled circles) and blue (open circles). The y observations of Chambliss are shown by the smaller filled circles.

Several conclusions may be drawn at this time. At a given phase, the noise in the light curve is frequently greater than the internal precision of the observations would suggest. It is clear that this noise is not due to HD 35777. Similar noise can also be recognized in the observations of Chambliss and indicates some intrinsic variability of at least one of the stars. The light curve appears not to be flat between the eclipses, bearing out its description by Kunz and Stebbins (1916). Since, as Chambliss notes, the radii of the eclipsing members are fractionally small, this convexity of the light variation is likely to be due to a flattened distribution of circumstellar gas. Zizka and Beardsley have found ample evidence for such gas and it could be contributing to the noise in the light curve as well. The eclipses may be deeper than has been thought: 0.25 to 0.30 mag. for the primary and 0.15 to 0.25 mag. for the secondary. In view of the suspected intrinsic variability, however, this suggestion must be documented by more observations. The bandpass dependence for the eclipse depths awaits the removal of the dilution from η Ori AcB. This dependence is sure to be a very important correction for the present coverage of the light curve implies greater dilution for the blue than for the yellow observations, which is consistent with McAlister's interpretation of the component spectral types and absolute magnitudes. There is no doubt that the removal of the light dilution will increase the variation between the eclipses, the intrinsic variability of the system, and the eclipse ranges. As a consequence, the eclipses are fairly geometrically deep and perhaps a reasonable determinate light curve analysis will be possible. Another season of observation is planned.

I am indebted to E. R. Zizká and W. R. Beardsley for sharing their results prior to publication, to W. Blitzstein for design changes and maintenance of the photometric system, and to D. E. Kjer for a night's observation. I am also grateful for the support offered by NSF grant AST 74-91656 A-01 which supported this work.

ROBERT H. KOCH
Department of Astronomy
University of Pennsylvania
Philadelphia, PA 19104, U.S.A.

References:

Chambliss, C. R. 1978, Comm. 27 I.A.U. I.B.V.S. No. 1398.

Kunz, J. and Stebbins, J. 1916, Pub. A. A. S. **3**, 272.

McAlister, H. A. 1976, Pub. A. S. P. **88**, 957.

Table 1. Differential Yellow and Blue Observations of η Ori AabcB

Hel. JD - 2443000.	$(V-C)_y$	n	σ	Phase	Hel. JD - 2443000.	$(V-C)_b$	n	σ	Phase
415.8756	-3.571	9	±0.008	0.3997	415.8759	-3.113	8	±0.004	0.3997
439.8155	3.513	14	0.012	0.3961	439.7941	3.128	12	0.019	0.3934
466.7103	3.539	15	0.004	0.7625	466.7113	3.159	16	0.003	0.7626
474.7300	3.538	20	0.005	0.7663	474.7405	3.118	21	0.003	0.7677
480.7453	3.470	22	0.004	0.5192	480.7636	3.150	22	0.006	0.5215
485.6342	3.551	16	0.002	0.1312	485.6556	3.151	10	0.006	0.1338
519.6503	3.538	10	0.011	0.3889	519.6240	3.156	19	0.005	0.3856
550.6053	3.534	15	0.003	0.2635	550.6173	3.176	16	0.019	0.2650
551.5280	3.517	18	0.003	0.3790	551.5400	3.167	14	0.002	0.3805
552.5631	3.332	12	0.005	0.5085	552.5723	3.000	12	0.005	0.5097
555.5664	3.588	20	0.009	0.8844	555.5803	3.192	20	0.005	0.8862
561.5947	3.538	5	0.011	0.6390	563.5499	3.212	11	0.005	0.8837
563.5399	3.549	11	0.002	0.8824	566.5480	3.216	12	0.002	0.2590
566.5385	3.567	13	0.003	0.2578	569.5743	3.210	13	0.002	0.6378
569.5659	3.543	12	0.003	0.6367	572.5276	-2.958	10	±0.004	0.0074
572.5188	3.302	12	0.002	0.0019					
573.5096	-3.585	12	±0.002	0.1303					

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1419

Konkoly Observatory
Budapest
1978 May 5

PHOTOMETRY OF AI Phe

AI Phe (BV 1513, HD 6980) was found to be a late-type eclipsing binary by Strohmeier (1972, IBVS 665), who noted that the period was probably several days. In order to determine the period and characteristics of the lightcurve for possible inclusion in the eclipsing binary program at the Copenhagen University Observatory, a search for eclipses was carried out between Sept. 1976 and Jan. 1977. The observations were performed with the 50 cm Danish Telescope at the European Southern Observatory, La Silla, Chile, equipped with a four-channel spectrophotometer. Filters of the Strömgren uvby system were employed.

Observations on 42 nights gave parts of 4 eclipses, and from a preliminary ephemeris B. Helt (private communication) obtained part of an eclipse in Sept. 1977 with the same instrument.

The final ephemeris is

$$\mathrm{HJD}\ 2443410.688\underset{\pm 4}{5} + 24.592\underset{\pm 1}{3} \cdot n.$$

Primary minimum has a depth in u,v,b,y in the instrumental system (which is very close to the standard system) of $1^{m}.24$, $1^{m}.05$, $0^{m}.83$ and $0^{m}.74$, respectively. The eclipse lasts almost 13 hours, which is a fraction of 0.02 of the period, and shows a totality of approximately 80 minutes duration. Only parts of the sides of the secondary minimum were observed. Their extension gives a depth in y of about $0^{m}.28$. Secondary minimum is displaced to phase 0.46, indicating an accentric orbit. The standard uvby indices outside eclipse are V=8.609, b-y=0.424, m_1=0.219 and c_1=0.357, with b-y increasing by about $0^{m}.1$ during primary minimum.

AI Phe is a double-lined spectroscopic binary. M. Imbert (private communication) has found, from spectra taken with the ESO 1.5 meter telescope at La Silla, that the primary component is of spectral type G2V, showing rather broad lines, and that the secondary component is of somewhat later type, possibly G5.

This is consistent with the uvby colours and their variation during primary minimum. The difference in spectral type between the components seems insufficient to explain the large difference in the depths of the two minima, which is therefore presumably due to the variation of the separation between the components in an eccentric orbit with $e \cos\omega$ close to zero.

Since relatively few late-type long-period eclipsing binaries have been studied, a full lightcurve will be obtained.

BO REIPURTH
Copenhagen University Observatory

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1420

Konkoly Observatory
Budapest
1978 May 5

IS 20 Cep A VARIABLE STAR ?

20 Cep (K4 III) has been used as the primary comparison star for photometry of VV Cep, which is a well-known eclipsing binary star and the egress is predicted to occur from April to August of 1978. From a narrow-band photometry at Dodaira Station of the Tokyo Astronomical Observatory, we find that 20 Cep became brighter in the period of 1977 December to 1978 January than in the period of 1976 November to 1977 February; the magnitude differences are $0^m.13$ in 3500 Å, $0^m.08$ in 4170 Å, and $0^m.05$ in 5080 Å.

Table 1 shows the standard stars used and the magnitude differences.

Table 1

Magnitude differences of 20 Cep between 1976 November to 1977 February and 1977 December to 1978 January.

Standard stars	Spectral type	Magnitude differences 3500 Å	4170 Å	5080 Å	Weight
δ And	K3 III	0.067	0.000	-0.006	1
107 Psc	K1 V	0.355	0.288	0.138	1
51 And	K3 III	0.224	0.149	0.068	1
α Ari	K2 III	0.173	0.135	0.088	2
ι Per	GO V	0.142	0.068	0.041	2
ω Per	KO III	0.160	0.103	0.017	1
λ Aur	GO V	0.150	0.055	0.047	3
10 Lac	09 V	0.114	0.066	0.050	3
HR 8832	K3 V	0.057	0.052	0.024	5
weighted mean		0.132	0.083	0.047	

MAMORU SAITO

Tokyo Astronomical
Observatory, Japan

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1421

Konkoly Observatory
Budapest
1978 May 5

NEW VARIABLE STARS IN TRIANGULUM

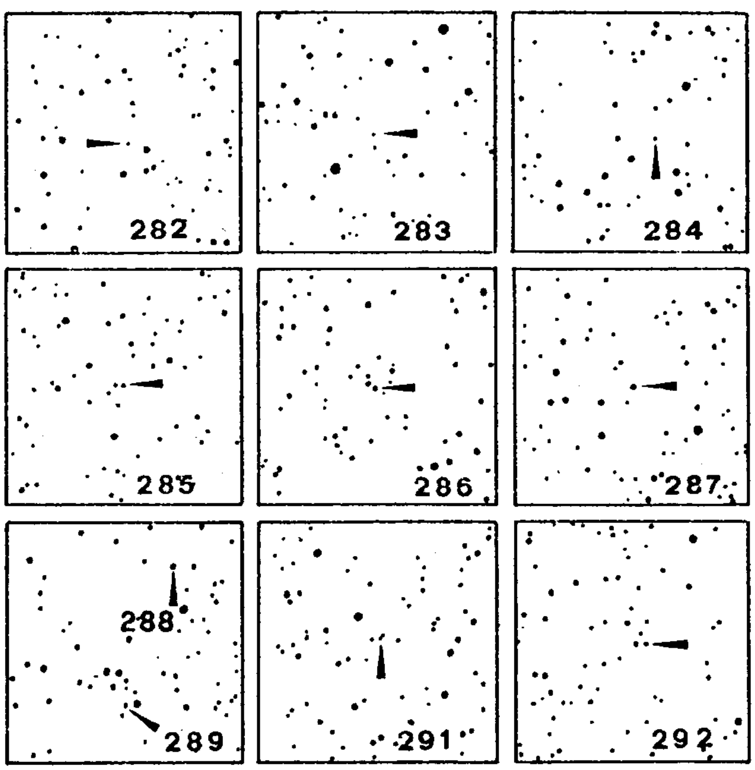
Eleven new variable stars have been discovered on the plates taken with the 67 cm Schmidt telescope on the field around M 33. Table I contains the list of the variables and their characteristics. The star GR 290, which is an Hubble-Sandage variable, belongs to the galaxy M 33 (1).

Table I

Var.	R.A.	D	max	min	type
GR 282	$1^h26^m29^s$	$+32°27'.3$	15.6	17.6	RR :
GR 283	1 26 39	+29 56.4	16.3	17.3	RR :
GR 284	1 27 38	+29 42.9	15.3	16.8	RR
GR 285	1 28 08	+31 23.1	14.2	15.4	L
GR 286	1 29 11	+29 33.7	14.7	16.7	E
GR 287	1 29 43	+31 08.9	14.8	<18.0	UG
GR 288	1 30 21	+32 20.1	14.4	15.5	RR :
GR 289	1 30 35	+32 12.2	15.8	17.0	E
GR 290	1 32 21	+30 27.1	16.5	17.8	H-S
GR 291	1 32 42	+31 15.5	17.0	17.8	E
GR 292	1 33 46	+31 45.6	13.3	16.5	UG

G. ROMANO
Istituto di Astronomia
dell'Universita di
Padova

(1) The finding chart will be published in Astr. & Astr.


282
283
284
285
286
287
288
289
291
292

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1422

Konkoly Observatory
Budapest
1978 May 8

VARIABILITY OF HD 47396 (CSV 798)

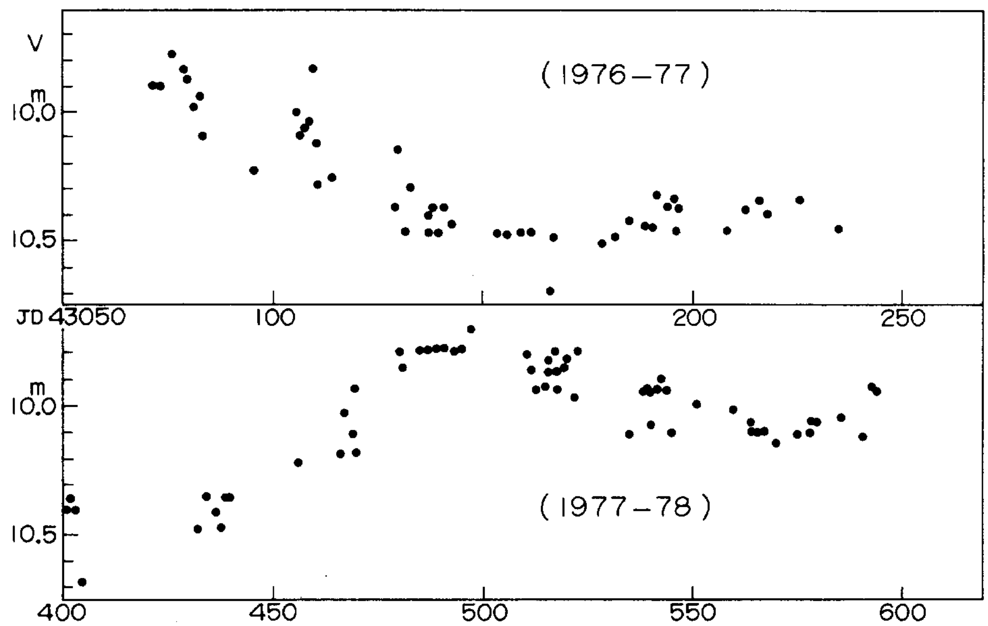
On about 170 photographs around ε Gem taken during October, 1976 and March, 1978, I detected fairly large change of brightness of HD 47396 which is listed as CSV 798. The used camera lenses are of focal lengths 200 and 300 mm. Panchromatic emulsions are used with yellow-green filter which gives brightness very close to visual magnitude.

The star is indicated as variable both in photometric and photographic in H.D. Catalogue (H.A., vol. 92, 1918), and the spectrum is given as peculiar. In remarks, it is added that the range is about one magnitude, but other facts concerning the variation are unknown.

The results of my measurements are plotted in Figure 1,which indicates the type to be probably SR, and suggests a period of roughly 200 days. The range of variation in the past two years is $9^m.7-10^m.7$ (v). It is remarkable that the star sometimes shows rapid change of brightness in several days amounting to almost half a magnitude. Observations of spectrum as well as brightness are desirable.

M. HURUHATA

Hodozawa 88,
Gotemba-shi, 412
Japan


V
m
10.0
10.5
(1976–77)
JD 43050
100
200
250
m
10.0
10.5
(1977–78)
400
450
500
550
600

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1423

Konkoly Observatory
Budapest
1978 May 12

uvby PHOTOMETRY OF THE Ap STAR HD 145102

Between February 22 and March 10, 1978 uvby photometric measurements of the silicon Ap star HD 145102 were made with the ESO 50 cm telescope at La Silla (Chile). As the weather conditions on February 25 and 26 were very bad, no observations were obtained in these nights.

Each observation sequence contained measurements (15s integrations in each filter) of the program star P and three comparison stars C1 (HD 146284), C2 (HD 145353) and C3 (HD 146606) as follows: C1 - P - C2 - P - C3 - P - C3 - P - C2 - P - C1. All three comparison stars proved to be constant : the standard deviation of their individual differential instrumental magnitudes (computed for each sequence) to the mean value (given in Table 1) during the observation run is in each filter always smaller than $0^{m}.004$.

Table 2 gives the differential magnitudes Δu, Δv, Δb and Δy for HD 145102 relative to HD 146606. They were determined as the mean value of the three numbers $(P-x) + \langle x-C3 \rangle$, each resulting from all measurements of P and x during one sequence. Here, x is or C1, or C2, or C3; $\langle x-C3 \rangle$ is the mean difference between x and C3 during the observation run. The table shows that HD 145102 is variable - at least in u - with an amplitude not larger than $0^{m}.01$. Variability in v, b and y is, with our quoted precision, marginal. To obtain the period of the variation, we used a method based on the technique of Lafler and Kinman (Hensberge et al., 1977). Due to the small amplitude of the variation and due to the fact that we were obliged to observe the star only at the end of the night (due to α), it was not possible to derive the period of variation unambiguously. The following values of the period are not contradictory with our observations: $0^{d}.539 \pm 0^{d}.005$, $0^{d}.584 \pm 0^{d}.01$, $0^{d}.772 \pm 0^{d}.01$, $0^{d}.873 \pm 0^{d}.01$, $1^{d}.17 \pm 0^{d}.02$, $1^{d}.41 \pm 0^{d}.02$, $3^{d}.44 \pm 0^{d}.15$, $7^{d}.0 \pm 0^{d}.3$. It should be sufficient to observe the star regularly during 4 consecutive nights to derive a definite value for the period of variation.

Table I

	Δu	Δv	Δb	Δy
HD146284-HD145353	0.330	0.229	0.236	0.259
HD146284-HD146606	0.290	0.185	0.252	0.384
HD145353-HD146606	0.040	0.044	0.017	0.125

Table II

	<P-C3>			
JD	Δu	Δv	Δb	Δy
2443560.868	0.503	0.393	0.417	0.484
61.853	0.494	0.385	0.415	0.482
62.856	0.490	0.383	0.411	0.477
63.874	0.493	0.387	0.414	0.476
66.855	0.488	0.383	0.406	0.478
67.861	0.502	0.395	0.424	0.484
68.854	0.498	0.384	0.408	0.477
69.858	0.487	0.384	0.408	0.477
70.854	0.500	0.387	0.415	0.481
71.860	0.504	0.384	0.417	0.483
72.859	0.495	0.389	0.407	0.480
73.856	0.490	0.385	0.408	0.477
74.863	0.500	0.493	0.419	0.485
75.821	0.494	0.387	0.412	0.478
76.845	0.490	0.384	0.409	0.481

D. VANBEVEREN and H. HENSBERGE

Astrophysical Institute
Vrije Universiteit Brussel
Pleinlaan 2
B-1050 Brussel
Belgium

Reference:

H. Hensberge, C. de Loore, E.J. Zuiderwijk, G. Hammerschlag-Hensberge, 1977, Astron.Astrophys. 54, 443

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1424

Konkoly Observatory
Budapest
1978 May 12

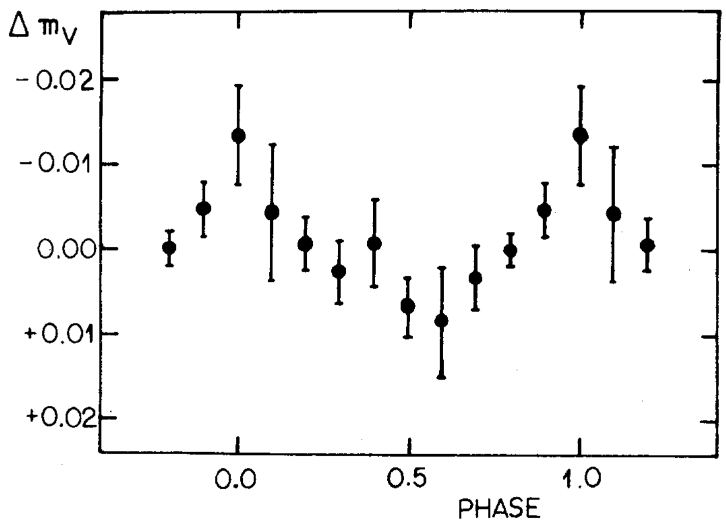
OPTICAL PULSES IN HD 153919 = 3U1700-37

An 06f supergiant star HD 153919 is the counterpart of the eclipsing X-ray source 3U1700-37 with the binary period $3^{d}.4$ (Jones et al. 1973). The optical light curve shows two shallow minima.The secondary optical minimum coincides with the X-ray eclipse (Penny et al. 1973, Jones and Liller 1973, van Paradijs et al. 1978).Recently the X-ray pulses with a period of 97 $\pm$ 1.5 min ($0^{d}.0674$ $\pm$ $0^{d}.0010$) were discovered by Matilsky and Jessen (1978). The optical variations of HD 153919 on the time scale of one to three hours had been already reported by van Genderen and Uiterwaal (1976) and by Kemp (1973).

This note presents results of a search for 97 min optical pulsations in an extensive set of the five-colour photometric observations of HD 153919 published by van Paradijs et al. (1978).

The observations made with the yellow filter have been examined for presence of the 97 min variability. An upper limit of about 0.002 mag can be set for the amplitude of such variations in observations obtained during the X-ray eclipse. Outside the X-ray eclipse the periodic pulsations are of very small amplitude, if present at all, with an exception of the orbital phases 0.44 - 0.55 when the periodic variations are clearly visible and attain an amplitude of 0.02 mag. These phases correspond to the primary optical minimum which occurs when the X-ray source is seen in front of the hot companion star. There are observations from four nights which fall in this range of phases. For these four nights it was possible to phase the short term variability with a period of $0^{d}.06678$ which is comfortably close to the X-ray period. A normal time of the light maximum is J.D. 2443024.272.

Fig. 1 presents the average light curve of the short term variations in HD 153919 obtained from observations with yellow fil-



ter for the interval of the orbital phases 0.44 - 0.59. If observations from all orbital phases are used then this light curve is again well defined but with 5-fold decrease in the amplitude. If other filters are used we obtain very similar light curves. A slight dependence of the amplitude and/or the time of the maximum on the wavelength is possible. Because the short term variability persists only during limited time every $3\overset{d}{.}4$ days many aliases can fit the observations almost as well as the period derived. The closest among aliases is a period of $0\overset{d}{.}06809$ which is also consistent with the X-ray period. It is very likely that the pulsation period of this object decreases quickly with time (Matilsky and Jessen 1978, Ziołkowski 1978). The optical observations have been obtained 200 days earlier than the X-ray data, therefore the $0\overset{d}{.}06809$ or even longer period is plausible for the considered set of the photometry.

There is another set of the photometric data (van Genderen and Uiterwaal 1976) taken 400 days earlier than the observations of van Paradijs et al. The short term variability during the primary optical minimum is clearly seen in Fig. 1 in the van Genderen and Uiterwaal paper. An attempt to determine possible periods from their data resulted in values $0^{d}.06638$, $0^{d}.06770$ and $0^{d}.06907$. Neither of them coincides with any period that can be fitted to the van Paradijs et al. data. A tentative picture is the period of $0^{d}.06907$ for the van Genderen and Uiterwaal data, then 400 days later $0^{d}.06809$ and finally still 200 days later $0^{d}.0674 \pm 0^{d}.0010$ from the X-ray data. A faster decrease of the period is also possible.

The presence of the optical pulses and especially their confinement to the narrow range of the orbital phases should be explained. This can be tentatively done by assuming that the primary optical minimum is at least partly due to a transit in front of the optical component of the semi-transparent cloud of gas situated around the X-ray source. This cloud of gas may have form of an accretion disc, or an accretion wake.The X-ray pulsations modify periodically the physical conditions and the velocity field in the nearby gas and this in turn influences the transparency of the gas cloud and consequently the fractional light loss and the optical brightness of the system.

A. KRUSZEWSKI

Warsaw University Observatory
al. Ujazdowskie 4
PL 00-478 Warszawa

References:

van Genderen, A.M., and Uiterwaal, G.M. 1976, Astr. and Ap., 52,139

Jones, C., Forman, W., Tananbaum, H., Schreier, E., Gursky, H., Kellog, E., and Giacconi, R. 1973, Ap.J. Letters,181,L43

Jones, C., and Liller, W. 1973, ibid. 184, L65

Kemp, J.C. 1973, ibid. 185, L21

Matilsky, T., and Jessen, J. 1978, IAU Circ., 3193

van Paradijs, J.A., Hammerschlag-Hensberge, G., and Zuiderwijk, E.J. 1978, Astr. and Ap. Suppl., 31, 189

Penny, A.J., Olowin, R.P., Penfold, J.E., and Warren, P.R. 1973, Monthly Notices R,A.S., 163, 7P

Ziołkowski, J. 1978, private communication

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1425

Konkoly Observatory
Budapest
1978 May 15

LIGHT VARIATION OF COD -37° 9248

Wegner (1976; COD -37° 9248) and Hunger and Kaufmann (1976; CPD -37° 6004) have independently announced, with different identification name, the high velocity of COD -37° 9248 (258 and 261 km/sec, respectively). Both announcements also referred to the hydrogen emission and the giant nature of the star. Photometric observations in 1976 differed considerably from the results published by Wegner so the star was followed as continuously as possible in 1977 with intermediate band and (RI) photometry. The complete results, together with additional data acquired in 1978, will be published later but the variation in V is indicated in Figure 1 (b-y) varies from near 0.7 mag at maximum light to 0.85 at minimum and R-I, from + 0.42 to + 0.7. Recent observations indicate a cycle length, including two unequal minima, near 150 days.

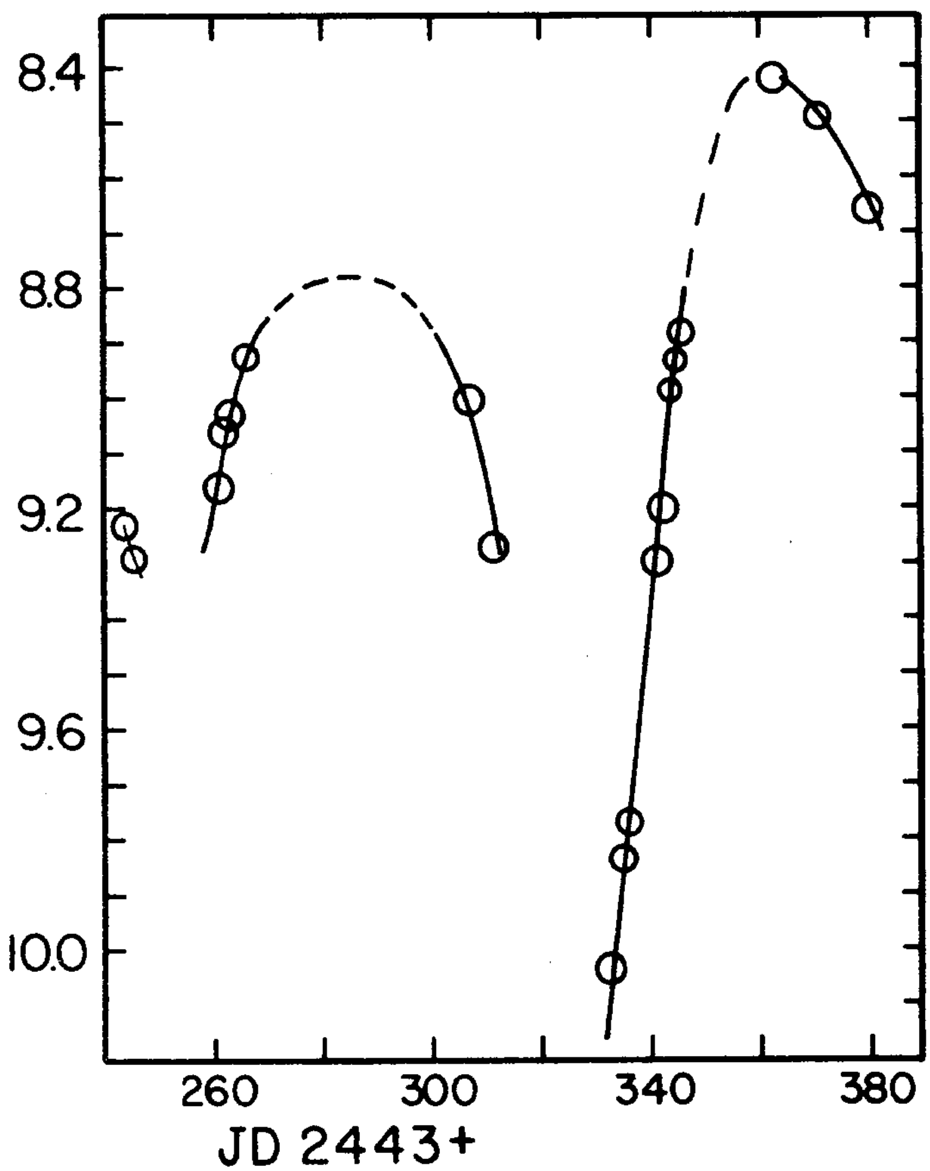
O.J. EGGEN

Cerro Tololo Inter-American Observatory

References:

Hunger, K. and Kaufmann, J.P.K. 1976 Astron. Astrophy. 50. 133

Wegner, G. 1976 Obs. 96, 13


8.4
8.8
9.2
9.6
10.0
260
300
340
380
JD 2443+

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1426

Konkoly Observatory
Budapest
1978 May 15

F, G AND K TYPE DWARF AND SUBGIANT, CLOSE BINARIES WITH H AND K EMISSION

A feature, and almost a fetish, of variable star astronomy is the creation of special- and to the initiated, esoteric - nomenclature. A recent example is the "RS CVn" (e.g. Hall 1972) class of variables which, originally contained eclipsing binaries with H and K emission lines but has grown to include nearly all close binaries, eclipsing or not. The difficulty with this situation is that it tends, for the wrong reasons, to focus attention on objects that become categorized as "RS CVn" stars and leave in the shadows stars that are physically related but do no happen to obey the current classification rules. The forerunner of the present classification is a series of lists, by Struve (1946), Hiltner (1947), Gratton (1950) and Popper (1976), of close binaries with H and K emission lines - a much clearer, albeit longer, label. I have collected photometric and astrometric data for many of these objects over the last 15 years and this is summarized in Tables 1 and 2, including much referenced data by others. The basic source of H and K emission stars is Bidelman (1954), and the "OCW" reference in Table 2 is to Wilson (1976). All other references to H and K emission presence or widths are given in the discussion below. Some of the little studied systems of most immediate interest may be HD 27130, 81410, 86590, 155555 and 166181 as well as BD +25°2511.

Sparsely represented, but possibly of fundamental importance in understanding the chromospheric activity in these stars, are the contact systems which combine many of the features of "RS CVn" stars and another, allied special classification of "BY And" stars. The H and K emission and the vagaries of the light curves, features of the "RS CVn" objects, are possibly more transient in the contact systems (Eggen 1958, Kuhi 1964, Huruhata 1952, Bergeat et al. 1972). One of the reasons for creating the "RS CVn" class, which includes an arbitrary period cut-off at two weeks, may have been an opinion that the light curve variations are caused by mass exchange, but the continuity of these variations to much longer periods and to obviously detached systems makes such exchange, at most, only one contributing factor. A similar, and perhaps connected, situation obtains for another special classification, the "Flare" stars. These M type dwarfs are generally believed to show violet chromospheric activity because of their youth. However there are some, obviously old M dwarfs that show the same activity. An outstanding example is Wolf 630AB, a visual binary which shares the space motion of a third, distant and much fainter companion (W629) which does not flare. The binary Wolf 630AB has a period of 1.7 years and the components are separated by 1.3 AU (e.g. Eggen 1965) and the implication is that even at this distance, the appearance of youth (i.e. flaring) is induced by the proximity of the stars to one another.

The space motions in Table 2 indicate that most of the objects discussed here are members of the old disk population (i.e. of Hyades age or older) and several appear to be members of such old disk population groups as the Wolf 630 Group and the 61 Cygni Group. The listed proper motions are based on all available data and are on the FK4 system with precessional corrections. There have been suggestions that some of these objects may be T Tauri stars, still in a pre-main sequence stage of evolution (e.g. Hall 1972) but this would appear to be inconsistent with the space motions. However, in this connection it is of interest to consider FK Ser (K5 V) which Herbig (1973) relates to a nearby early type star (HD 170740) and classifies as a post-T Tauri star. The GCVS classifies it as "BY And?" with a period of 5.20 days and a light amplitude of 0.6 mag. The star is a visual binary ($1''.3$) with the companion normally about one magnitude fainter. Herbig also noted hydrogen emission and a strong λ6706 (Li) absorption line in both components of the visual binary. The radial velocity and proper motion listed by Herbig, together with his derived luminosity of $M_V = +3.6$ mag, lead to $(U, V, W) = (-1, -38, +9)$ km/sec, a space motion very similar to that for Wolf 630 which is as old as the cluster M 67. The situation is reminiscent of HD 224085, the last star in Table 1, which has an even higher space motion, based on a trigonometric parallax, and also shows hydrogen emission and λ6706 (Li) absorption.

INDIVIDUAL SYSTEMS

HD 28. The spectroscopic orbit is by Harper (1926). Numerous (UBV) observations indicate a range of about 0.05 mag in V. The intermediate band indices (e.g. Eggen 1977b) are (b-y, M_1, c_1) = (0.625, 0.430, 0.450) mag, which, with (R-I), confirm the subgiant nature and give [Fe/H] near -0.5. However, as noted below, an infrared excess is a feature of several of these systems and R-I may be contaminated by this effect. All indices of this star are closely matched by those of some subgiants in the Wolf 630 Group; for example HD 27588A with (B-V, U-B, R-I, b-y, M_1, C_1, M_V) = (+1.08, +0.94, +0.38, 0.645, 0.440, 0.485, +1.3) mag (Eggen 1978).

HD 4502. A sinusoidal light variation with a visual range of 0.1 mag in the spectroscopic period was found by Stebbins (1928). The amplitude may not be constant. A discussion of the spectrum is given by Gratton (1950). This may be the most luminous object discussed here. Wilson (1976) found H and K emission lines too rotationally broadened to be of use in a luminosity estimate but the star is probably not as luminous as indicated by the spectroscopic luminosity class.

<u>HD 5303</u>. The variation in light (0.3 mag) was found by Strohmeier, Knigge and Ott (1965: BV 625). The spectra are discussed by Hearnshaw and Oliver (1977) and the spectral type is from Houk and Cowley (1975). The H and K lines, from the G star and hydrogen lines from the F star give equal velocity amplitudes. The stars are assumed to be of equal luminosity in Table 2 and, if the radial velocity is near 0 as indicated by Hearnshaw and Oliver, the system is probably a member of the 61 Cygni Group.

<u>HD 13530</u>. The long, spectroscopic period is doubtful. A possible member of the 61 Cygni Group with (U, V, W) = (+87, -54, -17) km/sec, which would give a luminosity more in line with the spectroscopic luminosity class; a high weight Allegheny parallax is 0.010 (wt.20) arcsec. As a result, this object may not belong here either on duplicity or luminosity grounds.

<u>HD 19845</u>. The luminosity from H and K widths is by Fitzgerald (1974) who also finds the components to be of near equal luminosity and mass (1.2 ⊙), although the secondary eclipse is relatively shallow (Popper and Dumont 1977). Popper (1976) derives radii of 1.6: and 2.8: ⊙ for the primary and secondary (eclipsed at secondary) stars. Surpisingly, the adopted luminosity leads to a space motion identical to that of the Hyades cluster. In the Hyades,

stars with the observed colors of HD 19845, corrected for a reddening of 0.05 mag, will have $M_V = +5.3$ mag. The possibility that the system is a member of the Hyades Group, and therefore some 5×10^8 years old, will be discussed below in connection with Z Her (HD 163930).

HD 21242. Young (1939) found H and K emission and double lines with a velocity separation of 120 km/sec from 8 plates. Carlos and Popper (1971) confirmed these results and found a period of 6.4 days with two components of near equal mass; they assigned a spectral type of G0 V to the primary. Harlan (1969) has previously classified the spectra of the system as G8 IV. The light variation, which is only about 0.05 to 0.1 mag, is phased with the orbital period but shows large variation in amplitude and form (see GCVS and supplements). The magnitude and color in Table 1 are based on a single observation in 1963 and indicate a large ultraviolet excess.

HD 22468A. This is ADS 2644A. The variable radial velocity was found at Mount Wilson and a plate obtained in 1921 showed double lines with a velocity difference of 120 km/sec. Photometry of both components of the wide pair (7") in 1963 lead to the suggestion that the A component may consist of a pair of very old subgiants (Eggen 1966). The (R, I) photometry in Table 1 is based on two identical observations, with the 100-inch reflector in 1963 and the 40-inch Mount Stromlo reflector in 1977. The 13 spectral plates in 1976/6 by Bopp and Fekel (1976) lead to the same velocity difference between the components that was noted at Mount Wilson in 1921, and gave a period of 2.873 days. The variation in the light of the combined components of ADS 2644 was first noted by Cousins (1962). The light variation is very similar to that of UX Ari, with a variable amplitude (0.1 mag) and form of light curve. Photometry of the fainter component of the wide pair gives (V, B-V, U-B) = (8.83, +0.99, +0.79) mag and Wilson (1964) finds the spectral type to be K3 V. Five Mount Wilson spectra of the B component give a mean radial velocity of -14 km/sec (see Abt 1969), which is nearly identical with the systemic velocity of A. Fitting the B component to the main sequence gives a modulus of 2.05 mag, or $M_V = +4.6$ mag for the near equal components of A (Eggen 1966). This luminosity places the components of A some 2 magnitudes above the main sequence at the observed color (B-V = +0.92). The value of R-I of A corresponds to a B-V some 0.1 mag redder than the observed color, indicating an IR excess. There is little doubt that the A and B components of ADS 2644 constitute a physical system. One hundred and thirty years of visual observations have shown an increase in position angle from 235° in

1841 to 264° and a separation from 6.2 arcsec to 6.6 arcsec. These results indicate only that the companion is now near apastron in a very long period orbit.

The luminosity of the components of A is one of the best established values for the stars discussed here and requires comment. The only available evolutionary computations that would place an old disk star in the otherwise unoccupied region between dwarfs and giants near K0 are those for binaries involving interacting components (e.g. Redsfel and Weigert 1969). The end product involves a white dwarf, red dwarf system similar to V 471 Tau in the Hyades cluster. The evolutionary model for this later system (Hills and Dale 1974), which has an initial period near 3 days, would represent ADS 2644A at an intermediate stage of its development. A very similar system, involving a hot subdwarf that is only slightly less evolved that the white dwarf in V471 Tau, is RU Peg (Eggen 1967). The photometry and luminosities of these three systems are listed in Table 3; VB 5 is a Hyades cluster member chosen for its similarity to ADS 2644B.

HD 23838. Young (1939) found a range of 40 km/sec, a mean velocity of 11.7 km/sec, and a spectral type of G0 from 12 plates. Four Mount Wilson plates give a range of 24 km/sec (see Abt 1969) and a mean velocity of 26.1 km/sec. A weighted mean has been adopted in Table 1. From an unpublished catalogue by Strömgren, Perry and Crawford the value of (b-y) = 0.485 mag. No value of R-I has been published but the red colors by Hall (1938) for G stars transform well to R-I, giving the value listed in Table 1. The (R-I, b-y) relation (Eggen 1977b) show the star to be a dwarf unless, like several objects discussed above, there is an (R-I) excess. Spectroscopic and photometric observations are needed.

+16°516. This red dwarf, white dwarf system (see Young and Nelson 1972) is discussed in connection with HD 22468 above. The UBV observations were obtained during the eclipse of the white dwarf (Young and Nelson 1972); the value of R-I is based on two observations with the Siding Spring Observatory 1 m reflector (R = 9.20 mag). The system is an outlying member of the Hyades cluster.

HD 27130. Sanford (1924) has derived a period of 5.6 days for the single lined spectrum. However, Wilson (1963) noted strong and double H and K emission lines on several plates. The similarity with LX Per would indicate that a more extensive study is important.

HD 27149. A member of the Hyades cluster. The double lines were found in the spectra by Woolley, Jones and Mather (1960) and the spectroscopic elements derived by

Battan and Wallerstein (1973), who also found a magnitude difference of 0.4 mag between the components and a mass ratio near 1. Although Batten and Wallerstein measured the H and K emission for velocity determinations they make no comment on the emission strength. Jorgensen and Olsen (1972) found no variation in light.

HD 30050. The spectroscopic elements are by Cesco and Sahade (1945) who also quote W.W. Morgan's classification of the primary component as a metallic line star. Morgan classified the secondary as a G8 subgiant with M_V near +3 mag. Grønbech (1975) has derived Strömgren indices for the two components; $(V, b-y, m_1, c_1) = (8.26, 0.285, 0.200, 0.867)$ mag and (8.71, 0.717, 0.340) mag for the primary and secondary, respectively. The primary has a value of (b-y) that is larger than for known Am stars (Eggen 1976) and the value of $\Delta[c_1]$ places it 3 mag above the main sequence at $M_V = +0.6$ mag. The secondary would then be a giant with $M_V = +1.1$ mag. This is brighter than the other stars discussed here but inherent uncertainties in the derivation of the luminosity, and the probable peculiarities of the spectrum, and therefore the color indices, leave the possibility that the faint component is nearer +3 or +4 mag.

<u>HD 44982</u>. The spectroscopic study is by Hiltner (1953) and a summary of observations of the light variation is given by van Woerden (1957). The light curve shows continual variation in form and amplitude. The available data indicate stars of near equal (solar) mass with the secondary star possibly slightly the more massive, as is the case in many of the systems discussed here.

<u>HD 65626</u>. This star is a double lined spectroscopic binary with the components of near equal mass and differing by only 0.4 mag (Harper 1939). The H and K emission was noted by Young and Koniges (1977) who find $M_V = +3.5$ mag. The listed photometry is based on two observations with the Palomar 20-inch reflector in 1966; the two observations were separated by 70 days and give identical values for the magnitude.

<u>HD 77137</u>. The radial velocity results are by Andersen and Popper (1975). The components are approximately equal in mass and luminosity. Variations in magnitude of 0.05 to 0.1 mag over a few hours were noted in the photometry. Two observations at maximum light give $(b\text{-}y, M_1, C_1) = (0.435, 0.210, 0.455)$ and the stars are very similar to HD 131923 (G5 V) in the Wolf 630 Group (Eggen 1978) with $(B\text{-}V, U\text{-}B, b\text{-}y, M_1, C_1, M_V) = (+0.71, +0.24, 0.455, 0.195, 0.460, +5.1)$ mag. If we adopted the lower luminosity of the later star the space motion in Table 2 would be little affected.

HD 81410. The light variation and the variable radial velocity based on observations by Wayman and by Jones, are discussed elsewhere (Eggen 1973) where a period near 25 days was derived. The light variation, of nearly 0.5 mag amplitude, shows changes in form over a longer period. Wayman (unpublished) classifies the star as K1 IV whereas Bidelman and MacConnell (1973) call it K1 III. Wayman notes strong H and K emission lines that give the same velocity as the absorption lines and Bidelman and MacConnell state that the 'Balmer lines are filled'. This system deserves more attention.

HD 83950. This is ADS 7494 but the companion is an optical one (Eggen 1963). However it was earlier noted (Eggen 1967) that the variable shares the proper motion of BD +55°1351, which is about 1° distant; (V, B-V, U-B) = (9.50, +0.97, +0.74) mag for +55°1351. This later star gives a modulus of 2.75 mag, from a main sequence fit, which also places the mean component of the variable on the main sequence, assuming equal components. The spectroscopic results are summarized by Struve and Horak (1950). Determinations of the systemic velocity vary from near 0 to -50 km/sec and a median of -25 km/sec was adopted here.

HD 86590. Four Mount Wilson plates (see Abt 1969) show a large range from -50 to +70 km/sec and four David Dunlap plates, -20 to +100 km/sec. The mean of all plates is +20 ± 60 (σ) km/sec. The photometric observations were made in February and May, 1963 and show a range of 0.08 mag in V. If the mean radial velocity is nearly correct the system may be a member of the Hyades Group. However, in contrast to this result, two observations in March 1978 give (V, b-y, M_1, C_1) = (7.75, 0.545, 0.270, 0.410) mag. Comparison with VB 91 in the Hyades cluster, for which (B-V, U-B, b-y, M_1, C_1) = (+0.88, +0.54, 0.520, 0.325, 0.400) indicates, both through M_1 and U-B, a much lower metal abundance for HD 86590. The visual mag was 7.90 on 2 April 1978.

HD 97528. The spectroscopic data is summarized by Miller and McNamara (1963) who also find M_V near 0 and +2 mag for the A and G type components, respectively. Individual masses of low weight were derived from double D lines on a single plate giving $13_{\odot}$ for A and $2^{\odot}$ for B. Observations in 1961 with the Cape Observatory 18 inch reflector are summarized in Table 4. Those for mid (total) primary eclipse should represent the secondary star. The adopted luminosity for A gives $M_V = +2.5$ mag for the companion, in agreement with Miller and McNamara. The system may belong to the Hyades Group. Observations in 1978 show a variable Hβ, perhaps caused by emission lines in the A component.

HD 106677. Young (1939) found a variable radial velocity, with a range of 30 km/sec, and strong H and K emission. Bopp et al.(1977) have shown that the lines are double and indicate a period of between 10 and 20 days. They also found a small light variation which may have a longer period. If the mean radial velocity is near the value adopted, the system consists of subgiants in the Wolf 630 Group; the V-velocity reflects 50 percent of the radial velocity.

HD 108102. Kraft (1965, also Weaver 1952) found this object, in the Coma Berenices cluster, to be a double lined spectroscopic binary with equal components and a one day period. Several series of photometric observations indicate that the light variation, if present, amounts to less than 0.05 mag.

+25°2511. Trumpler found a variable velocity with a range of 40 km/sec from 5 plates of this member of the Coma Berenices cluster. Wilson (1963) note sharp, double H and K emission lines. An examination of all available photometry shows a possible range in visual magnitude of over 0.1 mag. This object obviously requires attention.

HD 114519. The available radial velocity data is discussed by Popper (1961) who also gives the individual colors as B-V = +0.44 and +0.91 mag for the primary and secondary, respectively. The adopted luminosity of the bright component was derived by McNamara (1964) from intermediate band (1, c) photometry. The light curve shows variations from cycle to cycle that may be caused by nonuniform flux from the fainter component (e.g. Hall 1972).

HD 118216. The spectroscopic results are discussed by Conti (1967) who found H and K emission lines from the secondary component. Conti also detected the secondary component in UBVRI photometry, finding it to be 2.8 mag fainter than the primary (F4) component in V and with B-V = +1.36 and U-B = +1.91 mag. These colors are nearly identical to those of 61 Cyg B (K7 V). However, this result can not be reproduced in the extensive 13 color photometry by Johnson and Mitchell (1975). The 13 color results for HR 5110 are listed in Table 5 in the form of magnitudes; the effective wavelengths are essentially 10^2 x filter number. The magnitudes of HR 9072, a subgiant of type F4, are also shown in Table 4 after they were normalized to the 52 magnitude of HR 5110. The energy distributions in the 2 stars are remarkably similar from 3000 to 11000 Å. If we added a 61 Cyg B, which was 2.8 mag fainter than HR 5110 at 52, it would be only about 0.5 mag fainter at 110 and completely destroy the agreement with HR 9072 seen in Table 4. From the assumption that the F star has $1.5_{\odot}$, and the mass ratio from the orbit, Conti finds $0.4_{\odot}$ for the fainter star. This corresponds to M_V near +9 mag for a main sequence star (Eggen 1974). Strömgren photometry (Danziger and Faber 1971) indicates that the F star is about 1.8 mag above the main sequence, or M_V near +1.6 (Eggen 1971), making the magnitude difference between the components near 7.5 mag in the visual. The red component is then only slightly less luminous than 61 Cyg B and the energy distribution given by the 13 color photometry for 61 Cyg B indicates that it would still be more than 5 mag fainter than the F star at 110. The small, but high weight Allegheny trigonometric parallax, 0.019 (wt.28) arcsec, leads to $M_V = +1.4$ mag for the bright component, which agrees very well with the photometric determination.

HD 128171. The Mount Wilson spectroscopic results are listed by Abt (1973) and the systemic velocity in Table 1 was estimated from this material. The proper motion from the Yale Zone Catalogue has a probable error of 0.012 arcsec. Two observations in March 1978 gave (V, $b-y$, M_1, C_1) = (9.50, 0.690, 0.370, 0.355) mag at phase 0.017, near midprimary eclipse, and (9.14, 0.675, 0.310, 0.365) mag at phase 0.170, just after primary eclipse. These results indicate little difference between the components which match the indices of subgiants in the Arcturus Group (Eggen 1978; [Fe/H] near -0.6).

HD 150708. From observations obtained at total eclipse (Eggen 1963a) the individual components of the eclipsing system were found to have (V, B-V, U-B) = (9.49, +0.97, +0.63) mag and (9.00, +0.65, +0.11) mag for the fainter and brighter stars, respectively. The variable is the A component of ADS 10152 (8"); B has (9.67, +0.57, +0.05) mag and spectral type F8 V. The eclipsing components have near equal mass (Joy 1941, Eggen 1955). The visual companion gives a modulus of 5.0 mag (Eggen 1963a).

HD 155555. Bennett, Evans and Laing (1962) found double lines, nearly equal mass components and a period of 1.687 days. Stoy (1963) gives (V, B-V) = (6.67, +0.80) mag. However, two observations in 1973 with the Siding Spring 1 m reflector give (V, B-V, U-B,R, R-I) = (6.83, +0.835, +0.29, 6.46, +0.325) mag. The star is also the A component of LDS 587 and the results for B are (12.82, +1.54, +1.05, 11.40, +1.205) mag. The companion is 33 arcsec distant but even if it was included by Stoy it could not explain the observed magnitude difference, and the bright star is apparently variable. The (UBV) results indicate a very large ultraviolet excess and a comparison of B-V with R-I indicates an IR excess. If we fit the (R-I) of the faint companion to the young disk main sequence, we obtain a modulus of 1.1 mag, which places the bright star (assumed to be composed of equal components) also near the main sequence: the resulting parallax is 0.06 arcsec. The resulting space motion is that of a young disk star and is similar to that for HD 81410 above. Although Bennett et al. state that eclipses were searched for and no light variation found, the large difference in the available V magnitudes indicates that further photometric work is desirable.

HD 163930. Popper (1956) has discussed the spectroscopic and photometric results, deriving near equal masses for the two components and B-V = +0.48 and +0.91 mag for the bright and fainter, respectively. The system is a member of the Hyades Group (Eggen 1960), giving a modulus of 3.4 mag. This modulus also places the F star on the Hyades main sequence and gives M_V = +5.2 mag for the K star (B-V = +0.91), making it similar to the well determined value for the components of HR 1099A discussed above and strengthening the argument for group membership of HD 86590, also discussed above.

+22°3245. Spectroscopic elements for this double lined system of equal subgiants (G8 IV) have been published by Imbert (1971). The photometry in Table 1 is based on two observations at maximum light in 1960 with the 100 inch Mount Wilson reflector. A third observation near minimum light shows only a small increase in both B-V and U-B. A third star, some 18 arcsec distant, gives (V, B-V, U-B) = (13.50, +0.57, 0.00) mag from three observations. If the faint star is a main sequence, common proper motion companion to the variable, the modulus of the system is 8.9 mag and the equal components of the variable have M_V near +1.3 mag. It seems likely that the faint star is an optical companion only. The adopted modulus is based on the similarity of the components to those in HR 1099 A.

HD 166181. Nadal, Pedoussant and Ginestet (1974) give the spectroscopic elements for this single lined binary, discuss the variation between the H and K line velocities and those from the absorption lines, and derive the luminosity in Table 2 from the H and K emission widths. Eight observations with the Palomar 20 inch reflector in 1962 (January to August) show a variation of 0.1 mag in V. More photometry is required.

HD 175742. Four Mount Wilson plates show a total range of 95 km/sec in the radial velocity (see Abt 1973). The Allegheny parallax, 0.041 (wt.28) arcsec, gives M_V near +6.4 mag and the star is probably a main sequence object.

HD 178450. Four Mount Wilson plates show a total range of 40 km/sec (see Abt 1973) and five from the David Dunlap Observatory (Heard 1956) show a range of 65 km/sec; the mean velocity is 0 ± 23 (σ) km/sec. The photometry is the result of a single observation in 1962.

HD 179094. Young (1944) derived the spectroscopic orbit with a period of 28.6 days. Herbst (1973) suspected light variations with an amplitude near 0.05 mag that may not be correlated with the spectroscopic period. Young and Koniges (1977) find $M_V = -1.2$ mag from the H and K emission widths but this may be too bright, although the CN measurements by Griffin and Redman (1960) are consistent with those for a giant star.

HD 196925. Three Mount Wilson plates (see Abt 1973) give a range of 15 km/sec in the velocity. The companion is +80°662 and has the same proper motion as the bright star (Eggen 1963a). Fitting the companion to the main sequence gives a modulus of 3 mag, or $M_V = +3$ mag for HR 7098, which agrees well with +2.9 mag derived by Wilson (1976) from the H and K emission widths. Apparently the Mount Wilson classification as a subgiant is more correct than K0 III assigned by Stephenson (1960). Stephenson calls the B component of type F8 V. Both components show nearly 0.2 mag ultraviolet excess, which, in the case of A, may result from the spectroscopic companion.

HD 200391. The photometric and spectroscopic observations are discussed by Northcott and Bakos (1967) and the H and K emission noted by Bond (1970). The vagaries of the light curves are similar to those for SV Cam and RT And.

HD 206031. The spectroscopic elements were derived by Sanford (1942) who confirmed the suspicions of Jones (1918) that the systemic velocity shows a small variation in a long (20 years?) period. The luminosity in Table 1 is based on membership in the Wolf 630 Group (Eggen 1978); Wilson (1976) finds $M_V = +2.1$ mag and Young and Koniges (1977) find +2.5 mag for H and K emission widths and the mean trigonometric parallax gives +2.6 mag.

HD 209318. The near equal components are subgiants of type G9 and K1 (Joy 1931). The photometry is based on a single observation at maximum light. The light curve is variable in form (Milone 1968) and the system shows an infrared excess (Milone 1976). A luminosity of $M_V = +3$ mag gives a space motion nearly identical to that of 61 Cyg (Eggen 1978).

HD 210334. The radial velocity and spectra of the equal components in this eclipsing binary are discussed by Sanford (1951). The photometry is based on 3 observations outside of eclipse in 1962. Chambliss (1976) finds (V, V-B, U-B) = (6.75, +0.93, +0.58) mag at the total, primary eclipse and this result will be assumed to apply to the primary star. One of the earliest suggestions that the light curves of this and other variables subject to 'distortions' caused by star spots was made by Kron (1959).

A detailed discussion of the spectrum is given by Naftilan and Drake (1977), who find the primary has solar abundance but that the secondary is underabundant. Naftilan (1975) found the same result for HD 114519 (RS CVn). The adopted luminosity in Table 2 gives the system the space motion of the Wolf 630 Group. However, even if a group member, the luminosity is indeterminate by this means because the V-velocity is a reflection of the radial velocity only.

HD 213389. This single lined spectroscopic binary is discussed by Northcott (1947) who also finds a spectroscopic luminosity of $M_V = +2.2$. Herbst (1973) discovered a light variation with an amplitude of 0.13 mag phased, in a double wave, with the orbital period.

HD 216489. The single lined spectroscopic orbit is discussed by Harper (1920). Herbst (1973) found a light variation with an amplitude of 0.16 mag that is out of phase with the orbital period. The assumed luminosity is that of the very similar star HD 213389 (above).

+52°3383a. Payne-Gaposchkin (1946) found a double lined spectrum with near equal components. The light curve and its instabilities are discussed by Gordon (1955). A more detailed spectroscopic study is badly needed.

HD 219113. Jakate, Bakos, Fernie and Heard (1976) have discussed the photometry and spectra of this object. They find double lines from stars of near equal mass with the late type object being slightly the more massive, as true for most of the stars discussed above. From the photometry of Jakate et al. the late type star has (V, B-V, R-I) = (7.65, +0.99, +0.415) mag from the apparently total eclipse leaving (8.15, +0.35, +0.1:) mag for the F star. The main sequence luminosity for the F star is then M_V = +3 mag, which agrees well with the estimate of Jakate et al.

HD 222107. Radial velocity and H and K emission observations are summarized by Gratton (1950). From the H and K emission widths Wilson (1976) finds values of M_V ranging from +2 to 0 mag but the high weight, trigonometric parallax of 0.043 (wt.24) arcsec gives M_V = +2.2 mag. Many series of observation show small light variations of over 0.25 mag in a period near 50 days.

HD 224085. The available radial velocity data is summarized by Halliday (1952). The available photometry indicates a variation in the visual magnitude of some 0.1 mag. The high weight Allegheny parallax, 0.039 (wt.28) arcsec, gives M_V = +5.5 mag, placing the star some 1.5 mag above the main sequence value for the observed B-V, or over 2 mag for the observed R-I. The resulting space motion is very similar to that of Epsilon Eri with which HD 224085 makes an interesting contrast; Epsilon Eri has essentially the same B-V as HD 224085 but it is classified K5 V and has U-B = +0.98 mag and R-I = +0.405 mag. The system of HD 224085 may be similar to HD 128171 (RV Lib) and a search for the secondary component in the spectrum may be warranted. Rucinski (1977) has published a recent photometric study and noted the presence of λ6706 (Li) in the spectra.

OLIN J. EGGEN
Cerro Tololo Inter-American Observatory*
La Serena, Chile

*Cerro Tololo Inter-American Observatory is supported by the National Science Foundation under contract No. AST 74-04128.

Table 1

Close binaries of F, G and K types dwarfs and subgiants with H and K emission

Name	HD	V Mag	B-V Mag	U-B Mag	R-I Mag	P (days)	ρ (km/sec)	μ_α (0."001)	μ_δ (0."001)
HR 3	28	4.6 Var	+1.05	+0.90	+0.39	72.9	-6.1	-13	+89
HR 215	4502	4.0 Var	+1.10	+0.90	+0.41	17.8	-23.7	-98	-82
	5303	7.7 Var	+0.67	-	-	1.8	0:	-238	+22
HR 645	13530	5.32	+0.93	+0.62	+0.34	1650.	+27.3	+355	-171
LX Per	19845	8.1 Var	+0.75	+0.28	-	8.0	+27.0	+45	-68
UX Ari	21242	6.26	+0.95	+0.47	-	6.4	+26.5	+38	-107
HR 1099 A	22468	5.8 Var	+0.92	+0.43	+0.39	2.8	-14.0	-29	-62
HR 1176	23838	5.80	+0.70	-	+0.29:	-	+15:	-39	-24
V 471 Tau	+16°516	9.71	+0.92	+0.59	+0.355	0.5	+36.8	+117	-22
	27130	8.34	+0.775	+0.33	+0.29	5.6	+38.2	+118	-2
	27149	7.52	+0.68	+0.25	+0.215	75.6	+39.6	+114	-28
RZ Eri	30050	7.70	+0.65	+0.35	-	39.3	+32.0	+21	-6
SV Cam	44982	8.68	+0.72	+0.46	-	0.6	-13.0	+44	-147
HR 3119	65626	6.49	+0.625	+0.165		11.1	+25.8	+30	-62
TY Pyx	77137	6.85	+0.685	+0.26		3.2	+63.2	-54	-49
	81410	7.4 Var	+1.05	+0.70	+0.45	25.4:	0:	+37	-33
W UMa	83950	7.7 Var	+0.66	+0.08		0.33	-25:	+21	-24
	86590	7.7 Var	+0.88	+0.43			+20:	-242	-46
TT Hya	97528	7.2 Var	+0.185	0.00		7.0	+10.5	-26	+7
HRY 665	106677	5.4				10-20	-47:	-21	-38
	108102	8.15	+0.50	0.00	+0.19	1.0	-0.4	-10	-16
	+25°2511	9.7 Var	+1.09	+0.80	+0.30	-	(0.0)	-11	-22

Table 1 (continued)

Close binaries of F, G and K types dwarfs and subgiants with H and K emission

Name	HD	V Mag	B-V Mag	U-B Mag	R-I Mag	P (days)	ρ (km/sec)	μ_α (0."001)	μ_δ
RS CVn	114519	8.2 Var	+0.59	+0.09		4.8	-15.0	-49	+4
HR 5110	118216	4.96	+0.38	+0.05	+0.19	2.6	+7.4	+84	-9
RV Lib	128171	9.0 Var	+1.02	+0.65		10.7	-30:	-22	-26
WW Dra	150708	8.6 Var	+0.72	+0.21		4.6	-28.5	+12	-61
	155555	6.8 Var	+0.835	+0.29	+0.325	1.7	+2.3	-8	-133
Z Her	163930	7.3 Var	+0.59			4.0	-46.0	-22	+70
	166181	7.6 Var	+0.72	+0.13		1.8	-13.4	+115	-27
MM Her	+22°3245	9.5 Var	+0.84	+0.39		8.0	-50.8	+2	-34
	175742	8.4				-	-6:	+125	-288
	178450	7.63	+0.73	+0.21		-	0:	+110	+115
HR 7275	179094	5.80	+1.10	+0.86		28.6	+4.2	-106	-53
HR 7908	196925	5.98	+0.98	+0.60		-	-14:	+75	+221
ER Vul	200391	7.3 Var	+0.60			0.7	-25.2	+95	+7
HR 8283	206031	5.19	+0.665	+0.15	+0.24	13.1	-1.2	-123	-307
RT Lac	209318	8.9 Var	+1.10	+0.90		5.1	-47.5	+66	+37
AR Lac	210334	6.1 Var	+0.75	+0.29	+0.33	2.0	-36.0	-48	+55
HR 8575	213389	6.40	+1.15	+1.00		17.8	+5.4	-24	-29
HR 8703	216489	5.70	+1.10	+0.90		24.6	-12.3	-11	-29
RT And	+52°3383a	8.9 Var	+0.56			0.6	+20:	-1	-11
SZ Psc	219113	7.2 Var	+0.84		+0.35	4.0	+8.8	-1	-35
HR 8961	222107	3.8 Var	+1.00	+0.70	+0.40	20.5	+6.8	+162	-420
	224085	7.4 Var	+1.0-	+0.66	+0.50	6.7	-18.1	+546	+31

Table 2

Luminosities and Motions of Stars in Table 1

HD	Mv Mag	S	U	V (km/sec)	W	Sp
28	+2.4	OCW	+4	+12	-1	K0 III
4502	+1.9:	π	-24	-14	+7	K0 III
5303	+3.6	61 Cyg	+93	-53	-6	G2V + F0
13530	+2.4	OCW	+67	-33	-14	G9 III
19845	+3.6	HK	+40	-17	-21	G5 IV, G5 IV
21242	+2.5	Sp	+26	-20	-17	G8 IV
22468 A	+4.6	Cp	-23	-10	-2	G5 V
23838	+3:	-	+12	+9	-9	G0
+16°516	+6.35	Hy	+42	-17	-4	K0 V
27130	+5.6	Hy	+44	-17	+4	G8 V
27149	+5.0	Hy	+43	-17	-3	G2 V
30050	+0.6	$\Delta[c_1]$	+25	-39	+3	A_m+G8
44982	+4	-	+57	-61	-14	G3
65626	+3.5	HK	+22	-9	+20	F8
77137	+3.9	Orbit	+19	-63	-6	G2-5
81410	+3:	-	+3	-9	-28	K1 IV
83950	+5.6	Cp	-18	-9	-15	F8
86590	+5:	L	+41	-18	-10	K0 V
97528	-0.15	Hy	+36	-17	+1	A3 + G6
106677	+3.0	W630	-19	-33	-28	K0
108102	+4.4	CB	0	-7	-1	F8 V
+25°2511	+6.0	CB	-1	-9	-1	G9 V
114519	+3.2	c, ℓ	+20	-14	-14	F4, G

Table 2 (continued)

Luminosities and Motions of Stars in Table 1

HD	M_V Mag	S	U	V (km/sec)	W	Sp
118216	+1.6	$\Delta[c_1]$	-16	+12	+4	F2 (IV)
128171	+3.5:	-	+26	-14	-25	G2
150708	+3.9	Cp	-30	-23	-17	Sg G2, Sg KO
155555	+5.7	Cp	+5	-8	-6	G5 IV, KO
163930	+4.3	Hy	+44	-17	-4	F4 V, KO
166181	+5.2	HK	+3	+5	-42	G5 V
+22°3245	+4.6	-	+15	-46	-27	G8 IV, G8 IV
175742	+6.4	π	-19	-15	-29	dK1
178450	+5.5	pt.	+17	+10	-6	G8 V
179094	+2:	-	-21	-5	+20	K1 IV
196925	+3.0	Cp	+33	-32	-1	Sg G8
200391	+4.5:	-	+23	-23	-10	GOV, G5V
206031	+3.0	W630	-24	-33	-1	G2 IV
213389	+2.2	Sp.	-11	+7	-5	K2 III-IV
216489	+2:	-	-5	-12	+6	K1 III-IV
+52°3383a	+4:	-	+3	+19	-7	F8 V
219113	+3.0	M.S.	+7	+18	+2	F8V, K1IV
222107	+2.2	π	+1	-6	-48	G8 III-IV
224085	+5.4	π	+54	-41	-2	KO V

Table 3

Comparison of three systems

Star		B-V Mag	U-B Mag	R-I Mag	M_V Mag	P days
ADS 2644	A	+0.92	+0.43	+0.39	+3.85	2.8
	B	+0.99	+0.79	-	+6.8	-
RU Peg	A	+0.95:	+0.7:	+0.36	+6.6	0.4
	B	+0.81	+0.46	+0.30	+6.1	
V 471 Tau		+0.92	+0.59	+0.355	+6.35	0.5
VB 5		+0.99	+0.81	+0.34	+6.4	

Table 4

Observations of TT Hya

Phase	V Mag	B-V Mag	U-B Mag	N
0.580	7.30	+0.13	0.00	2
0.000	9.02	+1.015	+0.55	2
0.155	7.25	+0.185	0.00	2

Table 5

13 Color Results for HR 5110 and 9072

HR	33 Mag	35 Mag	37 Mag	40 Mag	45 Mag	52 Mag	58 Mag
5110	5.397	5.302	5.365	5.494	5.273	5.068	4.872
9072	5.386	5.285	5.345	5.509	5.286	5.068	4.835
Δm	+0.011	+0.017	+0.020	-0.015	-0.013	0.000	+0.037
HR	63 Mag	72 Mag	80 Mag	86 Mag	99 Mag	110 Mag	Sp
5110	4.701	4.595	4.454	4.406	4.333	4.268	F2 (IV)
9072	4.691	4.553	4.444	4.414	4.373	4.284	F4 (IV)
Δm	+0.010	+0.042	+0.010	-0.008	-0.040	-0.016	

References:

Anderson, J. and Popper, D.M. 1975, Astr.Astrophys.9, 131
Abt, H.A. 1969, Ap.J.Suppl., 19, 425
Abt, H.A. 1973, Ap.J.Suppl., 26, 365
Bennett, W.W., Evans, D.S., and Laing, J.D. 1962, Royal.Obs.Bull.61
Bergeat, J., Lunel, M., Sibille, F., and van't Veer, F. 1972, Astr.Astrophys. 17, 215
Batten, A.H. and Wallerstein, G. 1973, Pub.Dom.Astrophys.Obs.14,No.7
Bidelman, W.P. 1954, Ap.J.Suppl. 1, 175
Bidelman, W.P. and MacConnell, D.J. 1973, A.J. 78, 687
Bond, H.E. 1970, Pub.A.S.P., 82, 321
Bopp, B.W. and Fekel, F. 1976, A.J., 81, 771
Bopp, B.W., Hall, D.S., Henry, G.W., Fekel, F. and Landis F.J.,1977 I.B.V.S. No. 1352
Carlos, R.C. and Popper, D.M. 1971, Pub.A.S.P. 83, 504
Chambliss, C.R. 1976, Pub.A.S.P. 88, 762
Cesco, C.U. and Sahade, J. 1945, Ap.J., 101, 370
Conti, P.S. 1967, Ap.J. 149, 629
Cousins, A.W.J. 1963, Mont.Not.Astr.Soc.S.Africa, 22, 58
Danzinger, I.J. and Faber, S.M. 1971, Astr.and Astrophys. 18, 428
Eggen, O.J. 1948, Ap.J., 108, 15
Eggen, O.J. 1955, Pub.A.S.P. 67, 315
Eggen, O.J. 1958,
Eggen, O.J. 1960, Mont.Not.Roy.Astr.Soc. 120, 540
Eggen, O.J. 1963a, A.J., 68, 483
Eggen, O.J. 1963b, A.J., 68, 483
Eggen, O.J. 1965, The Observatory, 85, 191
Eggen, O.J. 1966, Roy.Obs.Bul. No. 120
Eggen, O.J. 1967, Mem.Roy.Astr.Soc., 70, 111
Eggen, O.J. 1971, Pub.A.S.P., 83, 741
Eggen, O.J. 1973, Pub.A.S.P., 85, 42
Eggen, O.J. 1974, Pub.A.S.P., 86, 697
Eggen, O.J. 1976, Pub.A.S.P., 88, 402
Eggen, O.J. 1977a,Pub.A.S.P., 89, 187
Eggen, O.J. 1977b, Ap.J., 215, 812
Eggen, O.J. 1978, Ap.J., (in press)
Fitzgerald, M.P. 1974, J.Roy.Astr.Soc.Canada, 68, 23
Gordon, K.C. 1955, Astron.J., 60, 422.
Gratton, L. 1950, Ap.J., 111, 31
Griffin, R.F., and Redman, R.O. 1960, Mont.Not.Roy.Astr.Soc.120,287
Grønbech, B. 1975, I.B.V.S., 956
Hall, D.S. 1972, Pub.A.S.P., 84, 323
Hall, J.S. 1938, Ap.J., 88, 319
Halliday, I. 1952, J.Roy.Astr.Soc.Canada, 46, 103
Harlan, J. 1969, Astron. J., 74, 916
Harper, I.W. 1920, Pub.Dom.Astrophys.Obs., 1, 100
Harper, I.W. 1926, Pub.Dom.Astrophys.Obs., 3, 341
Harper, I.W. 1939, Pub.Dom.Astrophys.Obs., 7, 149
Heard, J.F. 1956, Pub.David Dunlap Obs., 2, 107
Hearnshaw, J.B. and Oliver, J.P. 1977, I.B.V.S. No. 1342
Herbig, G.H. 1973, Ap.J. 182, 179
Herbst, W. 1973, Astron.& Astrophys., 26, 137
Hills, J.G. and Dale, T.M. 1974, Astron.&Astrophys.,30, 135
Hiltner, W.A. 1947, Ap.J., 106, 481
Hiltner, W.A. 1953, Ap.J., 118, 262
Houk, N. and Cowley, A.P. 1975, Michigan Spectral Catalogue of HD stars, Vol.1

Huruhata, M. 1952, Pub.A.S.P., 64, 200
Imbert, M. 1971, Astron. & Astrophys., 12, 155
Jakate, S., Bakos, G.A., Fernie, J.D., and Heard, J.F. 1976, Astron.J., 81, 250
Johnson, H.L. and Mitchell, R.I. 1975, Rev.Mex.de Astron.Astrophys., 1, 299
Jones, H.S. 1918, Cape Obs.Ann. 10. part. 8
Jorgensen, B.G. and Olsen, E.H. 1972, I.B.V.S., No.652
Joy, A. 1931, Ap.J., 74, 101
Joy, A. 1941, Ap.J., 94, 40
Kraft, R.P. 1965, Ap.J., 142, 681
Kron, G.E. 1959, Pub.A.S.P., 59, 261
Kuhi, L.V. 1964, Pub.A.S.P., 76, 430
McNamara, D.H. 1964, North American Aviation Inc. Report on Contract NONR-3979(00)
Miller, E.W. and McNamara, D.H. 1963, Pub.A.S.P., 75, 346
Milone, E.F. 1968, Astron.J., 73, 708
Milone, E.F. 1976, Ap.J.Suppl., 31, 93
Nadal, R., Pedoussant, A., Ginestet, N. and Carquillat, J.M. 1974, Astron.& Astrophys., 37, 191
Naftilan, S.A. 1975, Pub.A.S.P., 87,321
Naftilan, S.A. and Drake, S.A. 1977, Ap.J., 216, 508
Northcott, R.J. 1947, Pub.David Dunlap Obs., 1, 369
Northcott, R.J. and Bakos, G.A. 1967, Astron.J., 72, 89
Payne-Gaposhkin, C. 1946, Ap.J., 103, 291
Popper, D.M. 1956, Ap.J., 124, 196
Popper, D.M. 1961, Ap.J., 133, 148
Popper, D.M. 1976, I.B.V.S. No. 1083
Popper, D.M. and Dumont, P.J. 1977, Astron.J., 82, 216
Redsfel, S. and Weigert, A. 1969, Astron.& Astrophys. 1, 167
Rucinski, S.M. 1977, Pub.A.S.P. 89, 280
Sanford, R.F. 1924, Ap.J., 59, 356
Sanford, R.F. 1942, Ap.J., 95, 425
Sanford, R.F. 1951, Ap.J., 113, 299
Stebbins, J. 1928, Pub. Washburn Obs., 15, 29
Stephenson, B. 1960, Astron. J., 65, 60
Stoy, R.H. 1963, Mon.Not.Astr.Soc.S.Africa, 22, 157
Strohmeier, W., Knigge, R. and Ott, H. 1965, I.B.V.S. No. 100
Struve, O. 1946, Ann. d'Astrophys., 9, 1
Struve, O. and Horak, H.G. 1950, Ap.J., 112, 178
van Woerden, H. 1957, Leiden Ann., 21, 1
Weaver, H. 1952, Astron. J., 116, 612
Wilson, O.C. 1963, Ap.J., 138, 832
Wilson, O.C. 1964, Pub.A.S.P., 76, 238
Wilson, O.C. 1976, Ap.J., 205, 823
Woolley, R.v.d.R., Jones, D.H.P. and Mather, L.M. 1960, Roy. Obs. Bull. No. 23
Young, A. and Koniges, A. 1977, Ap. J. 211, 836
Young, A. and Nelson, B. 1972, Ap.J., 173, 653
Young, R.K. 1939, Pub. David Dunlap Obs., 1, 71
Young, R.K. 1944, J.Roy.Astr.Soc. Canada, 38, 366

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1427

Konkoly Observatory
Budapest
1978 May 15

THE ORBITAL PERIOD VARIATION OF SZ Psc

The eclipsing and spectroscopic binary SZ Psc (HD 21913) is known to show large period and light curve variations (Jakate et al. 1976). These authors found that the orbital period was decreasing with a period derivative $\dot{P} = -(6.0 \pm 0.5) \cdot 10^{-8}$ days/day.

Further observations made in the fall of the 1976 by Eaton (1977) and in the fall of 1977 by the present authors at Catania and Torino Observatory, show that the period is presently increasing.

In Table 1 we give the observed epochs (t_{obs}) of primary minima and O-C values computed according to the linear relation

$$t_E = \text{JD } 2442308.946 + 3.9658663 \cdot E.$$

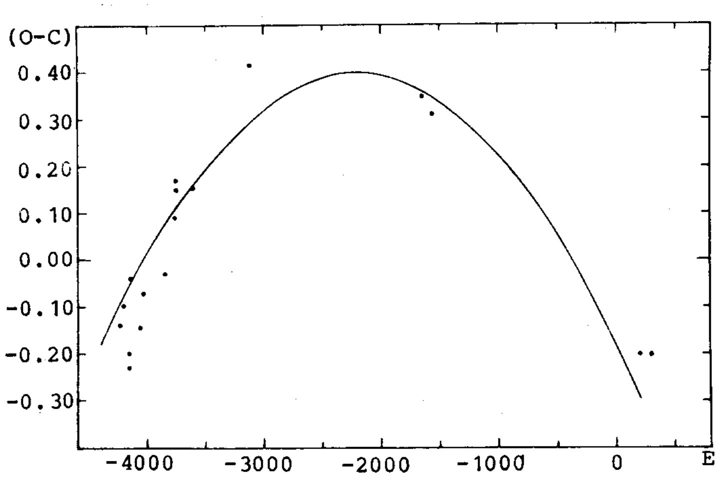
The mean period and starting epoch we assumed have been obtained by linear least square analysis of the observed epochs given in Table 1. The epoch from Eaton's observations is largely uncertain since only a limited portion of decreasing primary eclipse was observed. The epoch from Catania and Torino observations was determined as the average between the time of eclipse start and end. The trend of O-C values shows that the non linear elements given by Jakate et al. (1976) (represented by the continuous line in Fig.1) does not fit in with the present observations. It seems that the period variations of SZ Psc may be better represented by a classical sinusoidal curve. The amplitude of the O - C curve is about 0.6 day, which is one of the largest known for eclipsing binaries.

S. CATALANO, A. FRISINA, M. RODONO
Osservatorio Astrofisico Catania

F. SCALTRITI
Osservatorio Astronomico Torino, Italy

References:
Jakate, S.,Bakos, G.A.,Fernie, J.D.,Heard, J.F.1976,Astron.J.81,250
Eaton, J.A. 1977, I.B.V.S. 1297
Jensch, A. 1934, Astron. Nachr. 252, 393
Gaposchkin, S. 1943, Harvard Ann. 113, No. 2
Gaposchkin, S. 1952, Harvard Ann. 118, No. 6

t_{obs}	E	O - C	Remarks
25509.3950	-4236	-.1412	Jensch (1934)
25644.2780	-4202	-.0976	Jensch (1934)
25834.5070	-4154	-.2302	Jensch (1934)
25838.5040	-4153	-.1991	Jensch (1934)
25866.4230	-4146	-.0411	Jensch (1934)
26191.5220	-4064	-.1432	Jensch (1934)
26334.3650	-4028	-.0714	Jensch (1934)
27036.3650	-3851	-.0297	Jensch (1934)
27397.3800	-3760	.0915	Jensch (1934)
27421.2320	-3754	.1483	Rugemer(cfr.Jensch 1934)
27421.2530	-3754	.1693	Rugemer(cfr.Jensch 1934)
28000.2550	-3608	.1548	Gaposchkin (1943)
29935.8580	-3120	.4150	Gaposchkin (1952)
35741.8190	-1656	.3477	Jakate et al.(1976)
36114.5740	-1562	.3112	Jakate et al.(1976)
42308.7671	0	-.1789	Jakate et al.(1976)
43117.7800	204	-.2027	From Eaton(cfr.IBVS 1297, 1977)
43498.5020	300	-.2039	present paper



COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1428

Konkoly Observatory
Budapest
1978 May 19

PROBABLE NOVA BOOTIS 1962

In the course of a systematic search for variable stars by comparing 50 pairs of Sonneberg Sky Patrol plates of the constellations Coma Berenices, Bootes, Corona Borealis and Hercules I found a probable nova of $m_{pg} = 10^{m}.5$ on an isolated plate of 1962 December 3 (J.D. 243 8001.705).

Coordinates:

$$\alpha = 14^{h}36^{m}.4, \qquad \delta = +14^{\circ}20' \ (1855.0).$$

The object is invisible on the Palomar Sky Survey prints and on all the other Sonneberg plates of the region. Lying in a zone of noticeable optical distortion the image could easily be distinguished from a plate fault.

Dr. L.D. Schmadel of Astronomisches Recheninstitut Heidelberg kindly checked the first 1981 numbered minor planets for the given position and date, with negative result.

It would be of high interest if the object could be observed on further plates of other collections.

H. GESSNER

Sternwarte Sonneberg
Zentralinstitut für Astrophysik
der Akademie der Wissenschaften
der DDR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1429

Konkoly Observatory
Budapest
1978 May 19

ULTRAVIOLET FLARE IN FK Ser

In the course of analysing the data returned by the S2/68 ultraviolet sky-survey experiment aboard the TD-1 satellite in 1972-4, a systematic check for transient sources was undertaken. All known transient sources (e.g., novae) observed at other wavelengths between February 1972 and May 1974 were specifically examined, along with known flare stars within 25 pc of the Sun (Kunkel 1975). No previously observed transient phenomena were confirmed in the ultraviolet, but one apparent flare not known to have been observed elsewhere was recorded from the variable star discovered by Stienon (1971) and designated FK Ser (Kukarkin et al. 1976).

In view of the sensitivity limits of the S2/68 instrument (Boksenberg et al. 1973), there would have been little chance of detecting FK Ser, whose m_{pg} ranges from 10.9 (Hoffleit 1972) to 11.5 (Stienon 1971), save in the near-UV photometric channel A1 with FWHM 310 Å centred on 2740 Å. Indeed, no signal was detectable in the three spectrophotometric channels blueward of A1 in any of the 14 orbital passes, 5 of which were in any case contaminated by the nearby $8\overset{m}{.}50$ A3 star HD 168392. Two of the remaining (unblended) scans, both with the target well-centred, manifest a measurable signal in A1, a strong indisputable one on 27 September 1972 (J.D. 2441588.46243) and a weak probable one on 25 March 1974 (J.D. 2442132.44088). The respective fluxes were 1.9 ± 0.2 and 0.4 ± 0.1 in units of 10^{-12} erg $cm^{-2}s^{-1}Å^{-1}$. One orbital revolution (95 min) later , the 1974 flare becomes lost in background noise; the subsequent history of the 1972 flare is inconclusive because the target is too far displaced by the next scan.

The nature of FK Ser remains enigmatic: it has been likened to the BY Draconis variables by Stienon (1971), Hidajat (1971), and Chugainov (1974) although certain spectroscopic anomalies (Herbig 1973) and the infrared excess (Zappala 1974, Hackwell et al.

1974) suggest that it may be a post-T Tauri star at least 3 mag above the main sequence. Moreover, the conjecture that the nearby B2 IV-V star HD 170740 and FK Ser were coeval, on the basis of their proper motions which can be extrapolated back to a dark interstellar cloud, lends additional weight to the latter interpretation. Balmer emission lines have been reported by Stienon (1971), Hidajat (1971), MacConnell (1971), Herbig (1973), and Zappala (1974), while the latter two have also pointed out the strong Li I line at 6707 Å and Ca II H and K emission lines. MacConnell (1971) first identified FK Ser as BD-10°4662, but Herbig found it to be a close visual binary of similar magnitude ($\Delta m=0^m.5$) and spectroscopic characteristics (about K5p V for component A and K7p V for component B).

It is quite conceivable that the ultraviolet variability is greater than that in the visible on the following grounds: (1) the "strong ultraviolet continuum" reported by Stienon (1971); (2) the discrepancy between the (U-B) measures on two nights by N.K. Rao (Herbig 1973) and a value by R.J. Brucato (Zappala 1974) despite the agreement among all three (B-V) measures; and (3) the absence of infrared variability over timescales $\gtrsim$ known timescales of variability at shorter wavelenghts. Nevertheless, it would be instructive to examine any visible or infrared observations made simultaneously or contemporaneously with the two S2/68 observations, which are thought to represent the first mid-UV record of a stellar flare. Any such observations are earnestly solicited.

JON DARIUS

University of London Observatory
Mill Hill Park
London NW7 2QS, England

References:

Boksenberg, A., et al. 1973, Monthly Notices Roy.Astron.Soc. 163,291
Chugainov, P.F. 1974, Izv.Krymsk.Astrofiz.Obs. 52, 3
Hackwell,J.A.,Bopp,B.W., and Gehrz,R.D. 1974,Astrophys.J. 192, L79
Herbig, G.H. 1973, Astrophys. J. 182, 129
Hidajat, B. 1971, I.B.V.S. No. 559
Hoffleit, D. 1972, I.B.V.S. No. 724
Kukarkin, B.V., et al. 1976, Third Suppl. to the Third Edition of the G.C.V.S., Nauka, Moscow
Kunkel, W.E. 1975, Variable Stars and Stellar Evolution,IAU Symp.67, 15, D.Reidel, Dordrecht-Holland
MacConnell, D.J. 1971, I.B.V.S. No.570
Stienon, F.M. 1971, I.B.V.S. No. 545
Zappala, R.R. 1974, Astrophys. J. 187, 257

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1430
Konkoly Observatory
Budapest
1978 May 30

THE PERIOD OF SX CASSIOPEIAE

The study of Koch (1972) led to the measurement of some 200 blue plates, in and near primary minimum of SX Cas, with the Cuffey astrophotometer. Koch's B magnitudes of comparison stars were used.

In an attempt to secure the greatest accuracy (in the times of minima) warranted by the observations, the photometric observations by Dugan (1933) and the photoelectric B and V observations in Koch's study, as well as the photographic observations made here, were reduced by the same method. From each observation on the steeper parts of the primary minima, a time of minimum was found by applying to the time of the observation a correction equal to the time difference between a point on the mean curve through normal points, at the magnitude of the observation, and the mid-minimum. Neither Dugan nor Koch published all of the minima that could be derived from their observations.

The first four minima in Table I were derived from Dugan's observations. The others are from the measures of Oklahoma plates. The weights, p, were assigned to accord, as nearly as feasible, with Dugan's weighting system, with weight 0.5 for a minimum from one observation. The elements

$$\text{Hel. Pr. Min.} = 2433963.240 + 36\overset{d}{.}56717 \cdot E$$

are used for all E's and C's in their paper.

Table II lists the minima from the photoelectric observations in Koch's paper, as determined here. Since plots of the B and V observations showed that mid-minimum in B came earlier than in V, these are listed separately. The weighted means of the O-C's were for B, $-0\overset{d}{.}09$, and for V, $-0\overset{d}{.}06$. The weights (in column 3) apply to both the B and the V minima of the same date, except for the eighth date.

The first and third of the normal minima in Table III were computed from Dugan's Table I, with one by Safraniec in the third, taken from Koch's Table X. The second is from the four from Dugan's observations in Table I. The fourth and fifth embody the photographic minima in Table I, with one by Gunther, quoted by Koch, in the fourth. The last is the weighted means of all photoelectric minima in Table II and the one by Shao which is quoted by Koch.

The figure shows the mean O-C's, with error bars of lengths twice the means of the weighted residuals. The trend indicates that the period decreased from $36\overset{d}{.}5679$ to about $36\overset{d}{.}5666$ some time between 1930 and 1942. Careful timings of later minima are needed to confirm this change.

The eight photographic observations at epoch +57, near phase $+0\overset{d}{.}033$, were consistently above the mean curve by $0\overset{m}{.}015$, or early by $0\overset{d}{.}10$. If this minimum is assigned weight zero, the fifth normal in Table III is shifted to $\overline{p(O-C)}=-0\overset{d}{.}015\pm0.027$, with $\Sigma p=8$. It is shown by an open circle in the figure.

Table I. Single v and pg minima.

O-2400000	E	p	O-C
22 627.44	-310	2	$+0\overset{d}{.}02$
23 358.78	-290	2	+0.02
23 724.46	-280	1	+0.03
25 918.54	-220	2	+0.08
30 635.70	-91	0.5	+0.07
31 403.56	-70	3	+0.02
32 500.61	-40	3	+0.06
33 158.78	-22	2	+0.02
33 195.33	-21	2	0.00
33 597.63	-10	1	+0.06
34 036.35	+2	0.5	-0.02
34 292.29	+9	1	-0.05
35 754.98	+49	2	-0.05
36 047.45	+57	3	-0.12
36 193.83	+61	2	-0.01
36 779.00	+77	0.5	+0.09
37 217.73	+89	2	+0.01

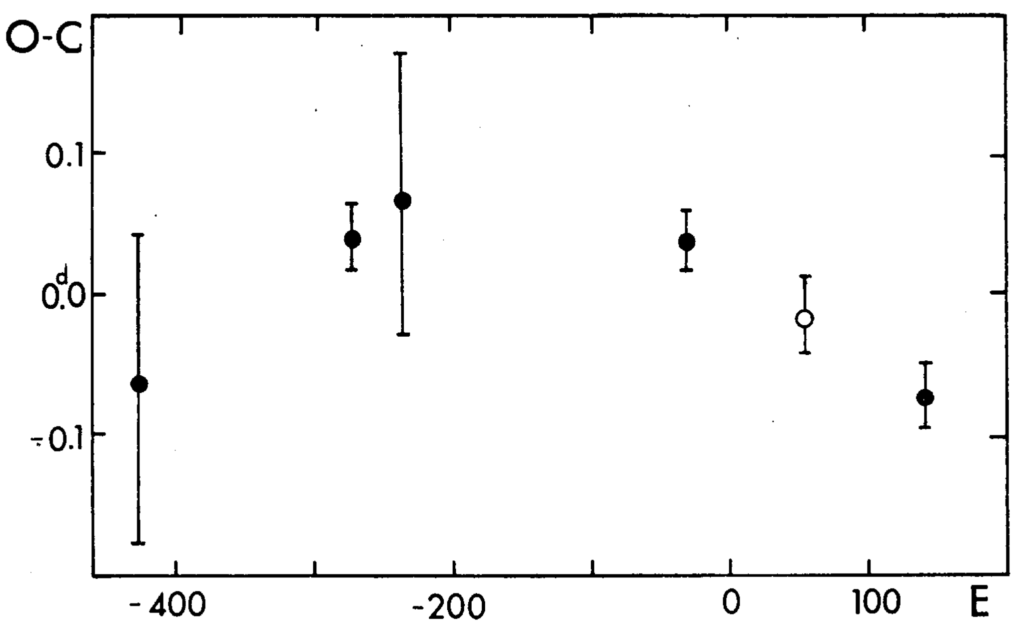

O-C
0.1
0.0
-0.1
-400
-200
0
100
E

Table II. Single photoelectric minima.

0-2430000	E	p	0_V-C	0_B-C
8899.81	+135	0.5	$-0\overset{d}{.}18$	$-\overset{d}{.}23$
8936.38	+136	0.5	-0.11	-.08
9009.51	+138	3	-0.03	-.08
9046.08	+139	0.5	-0.07	
9119.21	+141	1	-0.07	-.07
9155.78	+142	3	-0.03	-.10
9338.61	+147	0.5	-0.11	-.08
9411.75	+149	1,0.5	-0.09	-.17
9448.32	+150	3	-0.07	-.09
9484.88	+151	0.5	-0.02	+.01

Table III. Normal minima.

$\overline{pE}$	Σp	$\overline{p(0-C)}$	
-428	22.5	$-0\overset{d}{.}07$ ±	$0\overset{d}{.}11$
-274	7	+0.04	0.024
-239	24	+0.07	0.10
-32	14.5	+0.034	0.019
+56	11	-0.043	0.047
+141	29	-0.075	0.023

B. S. WHITNEY

University of Oklahoma
Norman, Oklahoma

References:

Koch, R. H. 1972, Astron. J. 77, 500.
Dugan, R. S. 1933, Princeton Obs. Contr. No. 13

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1431

Konkoly Observatory
Budapest
1978 June 7

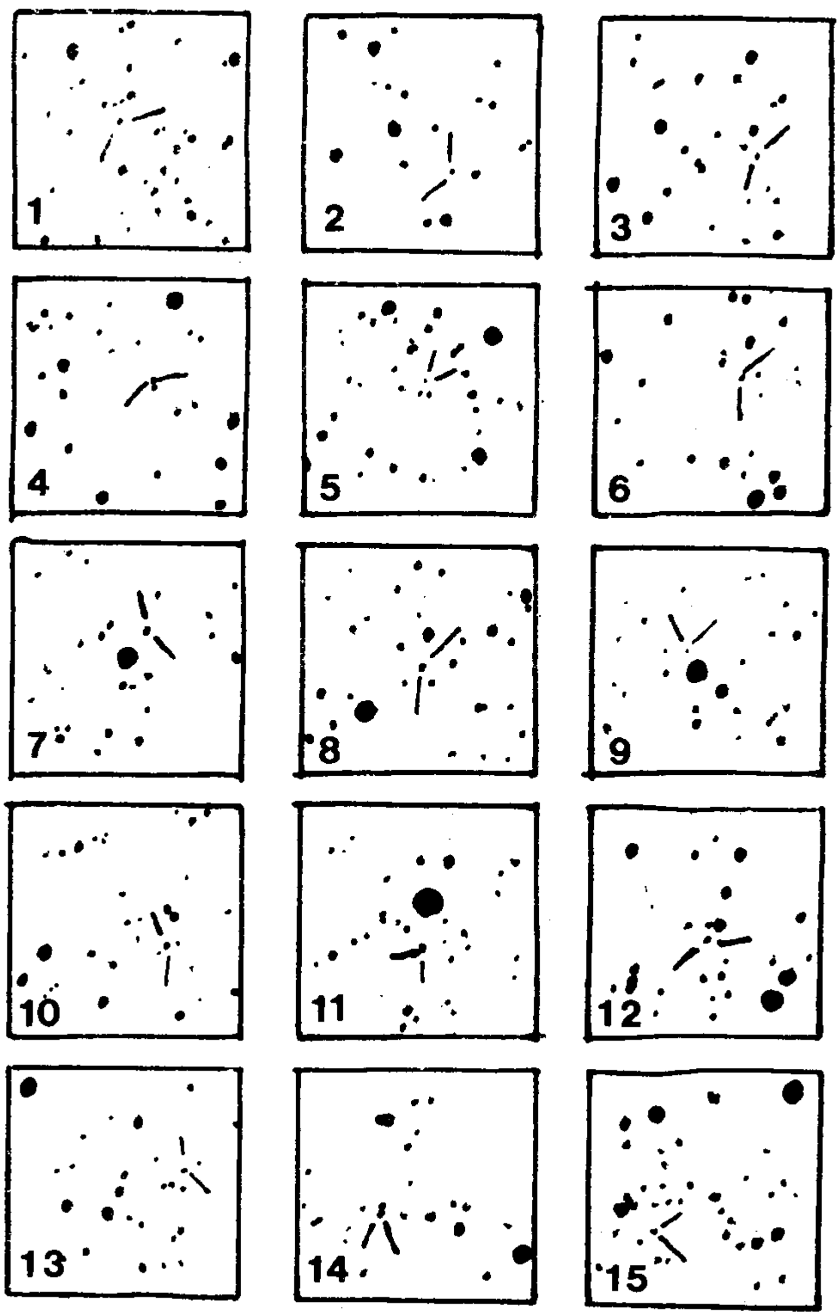
FINDER CHARTS FOR FIFTEEN SAGITTARIUS VARIABLES

Finder charts are presented for fifteen faint long period variable stars in Sagittarius. Their published magnitudes at maximum range from 13.0 to 14.2 pg. The charts,shown with South at the top, cover approximately 10′ x 10′. They are based on plates taken with the 7.5 inch Cooke triplet at the Maria Mitchell Observatory with a plate scale at the plate center (usually 18^h26^m $-25\overset{\circ}{.}5$) of approximately 248"/mm.

The following table identifies the variables in the Figure:

Chart	Var.Sgr.	Max	Chart	Var.Sgr.	Max	Chart	Var.Sgr.	Max
1	V1671	13.5	6	V1676	13.4	11	V1682	13.8
2	1672	14.2	7	1677	13.0	12	1685	13.1
3	1673	14.1	8	1678	13.7	13	1687	14.2
4	1674	14.1	9	1679	14.2	14	1688	14.0
5	1675	14.0	10	1681	13.9	15	1690	14.0

DORRIT HOFFLEIT
Maria Mitchell Observatory
Nantucket, Mass. U.S.A.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1432

Konkoly Observatory
Budapest
1978 June 8

PHOTOELECTRIC PHOTOMETRY OF SIGMA GEMINORUM AND HR 4665

Hall (1976) has characterized the group of binary stars with periods longer than two weeks and with G-K spectra displaying CaII in emission as being related to such well known eclipsing binaries as RS Canum Venaticorum and AR Lacertae. Two recently discovered members of this group are Sigma Geminorum and HR 4665. Although both of these systems are binaries, neither displays eclipses. During the present year this investigator has observed these systems, both at Kitt Peak National Observatory and at the Kutztown State College Observatory.

Sigma Geminorum is a single-lined spectroscopic binary, one of whose components is of spectral type K1 III. The orbital period was determined by Harper (1935) as 19.603 days. Observations were made by me with the 40-cm telescope no. 4 of KPNO during January, 1978. An RCA 1P21 photomultiplier, refrigerated with dry ice, was used together with a pulse-counting photometer. Observations were made with an intermediate-band y-filter. The observations at Kutztown State College were made with a 46-cm Cassegrain reflector from February to May, 1978. The photomultiplier was an unrefrigerated EMI 6256 SA (S-13 surface), and the observations were measured with a strip-chart recorder. Observations were made with a standard-band V-filter, but the KPNO and KSC observations were found to be similar enough to allow them to be combined together without using transformation equations.

The comparison star used was HR 2896 (K0 III). As a check star Iota Geminorum (K0 III) was used. The magnitude difference (ι Gem -HR 2896) was found to be -1.558 with $\pm$ $0^m.003$ as a mean residual for the KPNO observations, and -1.548 with $\pm$ $0^m.011$ as a mean residual for the KSC observations. Each observation of σ Gem is the mean of two individual readings. The phases of these observations have been calculated by the ephemeris given by Hall (1977a)

$$\text{Hel. JD} = 2418967.33 + 19\overset{d}{.}603\ E.$$

The observations are as follow:

KPNO - Hel. JD	Phase	σ Gem - HR 2896
2443508.675	0.918	-1.110
10.816	0.027	1.080
11.782	0.076	1.060
12.843	0.130	1.063
15.923	0.287	1.142
16.846	0.334	1.170
21.659	0.580	1.153
22.727	0.634	1.149
KSC		
2443563.569	0.718	-1.133
567.562	0.922	1.097
574.536	0.278	1.111
578.721	0.491	1.141
597.650	0.457	1.123
607.657	0.967	1.048
613.603	0.271	1.131
621.605	0.679	1.181
623.571	0.779	1.149
627.569	0.983	1.057
629.565	0.085	1.046

These observations are shown plotted in Figure 1. This figure resembles the one published by Hall, but the amplitude which I find is larger than that reported by him. The amplitude of the light variation is about $0\overset{m}{.}12$, and minimum light occurs between 0.00 and 0.10 phase according to the ephemeris used.

HR 4665 was reported to be variable by Hall (1977b). It is a double-lined spectroscopic binary, both components having spectral types of about K0 with CaII in emission. The orbital period has not yet been determined, but evidence indicates that it differs from the period of the light variation.

Observations were made using the same equipment as was used for σ Gem. The only difference was that a standard V-filter was used for the KPNO observations instead of an intermediate-band y-filter. The comparison star chosen was HR 4659 (K2 III). HR 4740 (G8 III) was used as a check star. For the KPNO observations the mean magnitude difference (HR 4740 - HR 4659) was found to be +0.616 with a mean residual of $\pm 0\overset{m}{.}009$. For the KSC observations these values were +0.600 and $\pm0\overset{m}{.}009$, respectively. The observations of HR 4665 are as follows:

KPNO - Hel. JD	HR 4665 - HR 4659
2443511.001	+0.486
16.046	0.506
17.060	0.505
KSC	
2443567.655	+0.418
574.769	0.476
578.735	0.484
597.669	0.560
607.681	0.580
612.584	0.556
613.634	0.527
621.631	0.457
623.585	0.434
627.614	0.426
629.589	0.441
648.587	0.509
650.669	0.502

Each of these observations is the mean of two individual readings. The KSC observations are shown plotted in Figure 2. These indicate an amplitude of about $0\overset{m}{.}15$. Hall has stated that the photometric period of HR 4665 is in the range 60 to 70 days. My observations confirm this period, but allow it to be refined. Hall's light curve shows a maximum at ca. JD 2443304 and a minimum at ca. JD 2443350. Figure 2 shows a maximum at ca. JD 2443626 and a minimum at ca. JD 2443605. Both of these intervals indicate a period of 64 days. Additional observations of HR 4665 will enable its period to be more precisely determined. The apparent difference between the spectroscopic and photometric periods remains to be verified.

This investigator wishes to thank Dr. D.S. Hall of Vanderbilt University for suggesting the need for observations of these two systems to me.

CARLSON R. CHAMBLISS

Dept. of Physical Sciences
Kutztown State College
Kutztown, Pa. USA 19530

References:

Hall, D.S. 1976, I.A.U. Colloq. no. 29, part I. 287.

Hall, D.S. 1977a, Inf.Bull. on Var.Stars no 1328.

Hall, D.S. 1977b, Inf.Bull. on Var.Stars no 1352.

Harper, W.E. 1935, Pub. D.A.O. 6, 224.

Fig. 1

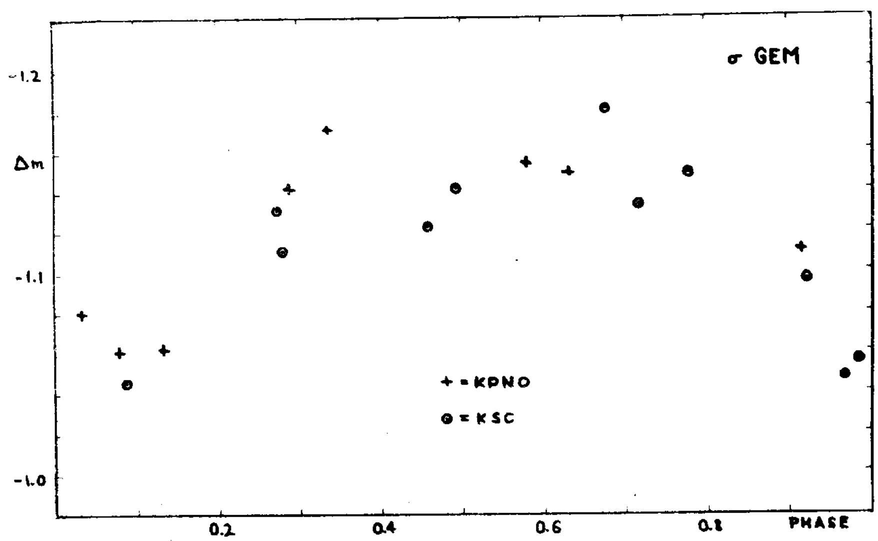
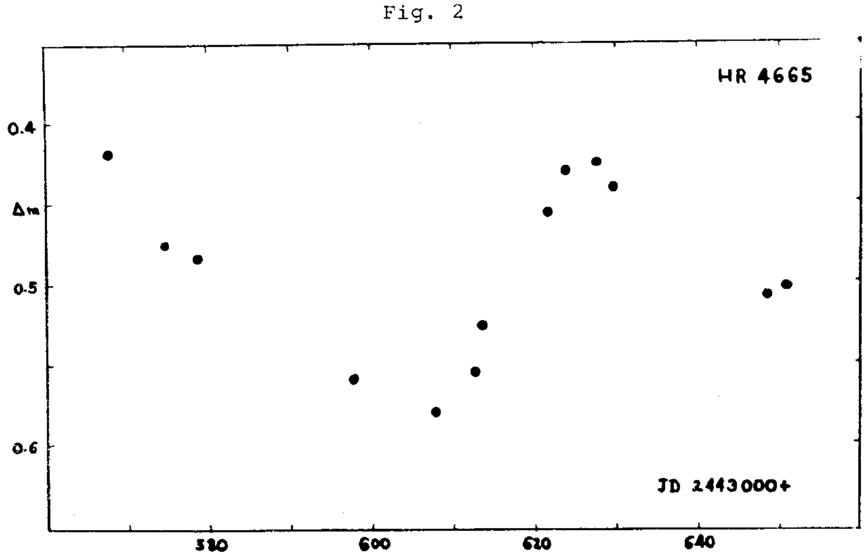

σ GEM
-1.2
Δm
-1.1
-1.0
+ = KPNO
⊙ = KSC
0.2
0.4
0.6
0.8
PHASE

Fig. 2


HR 4665
0.4
Δm
0.5
0.6
JD 2443000+
580
600
620
640

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1433

Konkoly Observatory
Budapest
1978 June 8

NEW VARIABLE STARS IN TRIANGULUM

Eleven new variable stars have been discovered on the plates taken with the 67 cm Schmidt telescope on the field around M 33. Table I contains the list of the variables and their characteristics. The star GR 290, which is an Hubble-Sandage variable, belongs to the galaxy M 33 (1).

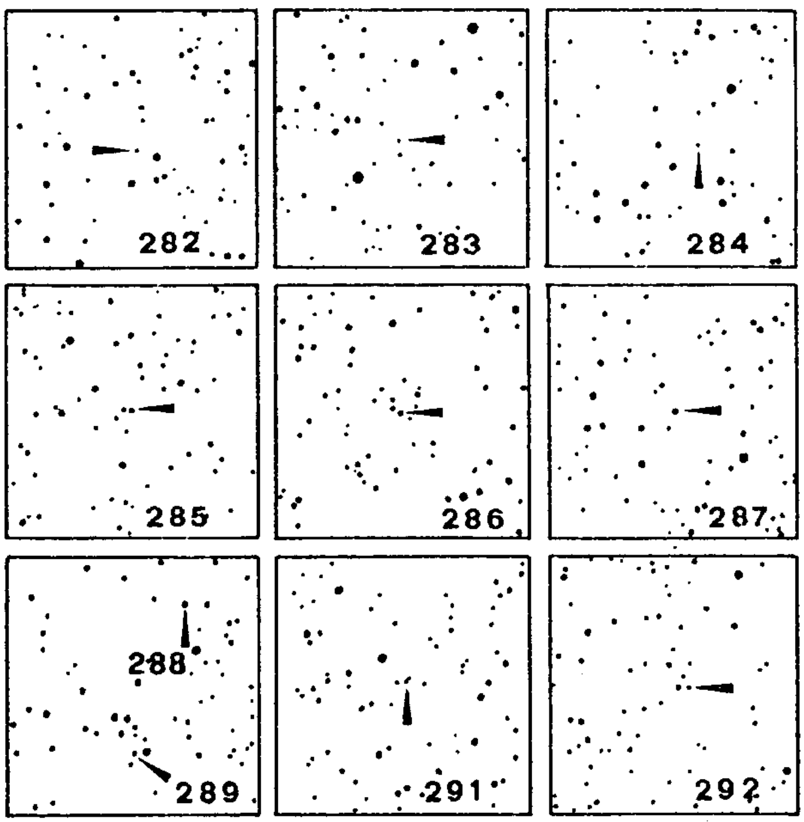
Table I

Var.	R.A.	D.	max	min	type
GR 282	$1^h26^m29^s$	$+32^\circ27'.3$	15.6	17.6	RR :
GR 283	1 26 39	+29 56.4	16.3	17.3	RR :
GR 284	1 27 38	+29 42.9	15.3	16.8	RR
GR 285	1 28 08	+31 23.1	14.2	15.4	L
GR 286	1 29 11	+29 33.7	14.7	16.7	E
GR 287	1 29 43	+31 08.9	14.8	<18.0	UG
GR 288	1 30 21	+32 20.1	14.4	15.5	RR:
GR 289	1 30 35	+32 12.2	15.8	17.0	E
GR 290	1 32 21	+30 27.1	16.5	17.8	H-S
GR 291	1 32 42	+31 15.5	17.0	17.8	E
GR 292	1 33 46	+31 45.6	13.3	16.5	UG

G. ROMANO

Istituto di Astronomia
dell'Università di
Padova

(1) The finding chart will be published in Astr. & Astr.


282
283
284
285
286
287
288
289
291
292

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1434

Konkoly Observatory
Budapest
1978 June 8

LONG PERIOD VARIABLES

The following long-period variables either lack published spectral types, or reported line emission, as listed in the General Catalogue of Variable Stars, through the Third Supplement. All have shown, on my objective prism plates, hydrogen-line emission of the Mira type.

Star	Obs.Spectrum	GCVS Spectrum	Notes
AH And	M5e	M4	1
BU And	M7e	-	2
V540 Cyg	M5e!	-	
AQ Her	M7e	-	1
WY Lyr	M3e	-	
HQ Lyr	M5e	M10	
MX Lyr	M3e	-	

1. Line emission also reported, with spectral type M implied, by Smak and Preston, Ap.J. 142, 943, 1965
2. Contained in the Two-Micron Survey by Neugebauer and Leighton, NASA Spec. Pub. 3047, 1969.

C.B. STEPHENSON
Warner & Swasey Observatory
1975 Taylor Road
E. Cleveland, OH 44112,U.S.A.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1435

Konkoly Observatory
Budapest
1978 June 9

A NEW FLARE STAR IN CASSIOPEIA ?

A new flare type object probably appeared on the photographic plate taken by the sky-patrol Tessar camera of the Sonneberg Observatory of the Central Institute for Astrophysics of the Academy of Sciences of the GDR on January 29, 1962 (J.D. 243 7694.262). On this plate the magnitude of the object was $m_{pg} = 11.1^m \pm 0.2^m$; the plates before and after (taken on January 27 and January 31, 1962) show the star at a brightness of $m_{pg} = 12.3^m \pm 0.2^m$. The examination of a series of plates of the Sonneberg Observatory, taken in the years 1928 - 1977, shows no other light changes; the brightness of the object remained at $m_{pg} = 12.3^m \pm 0.2^m$.

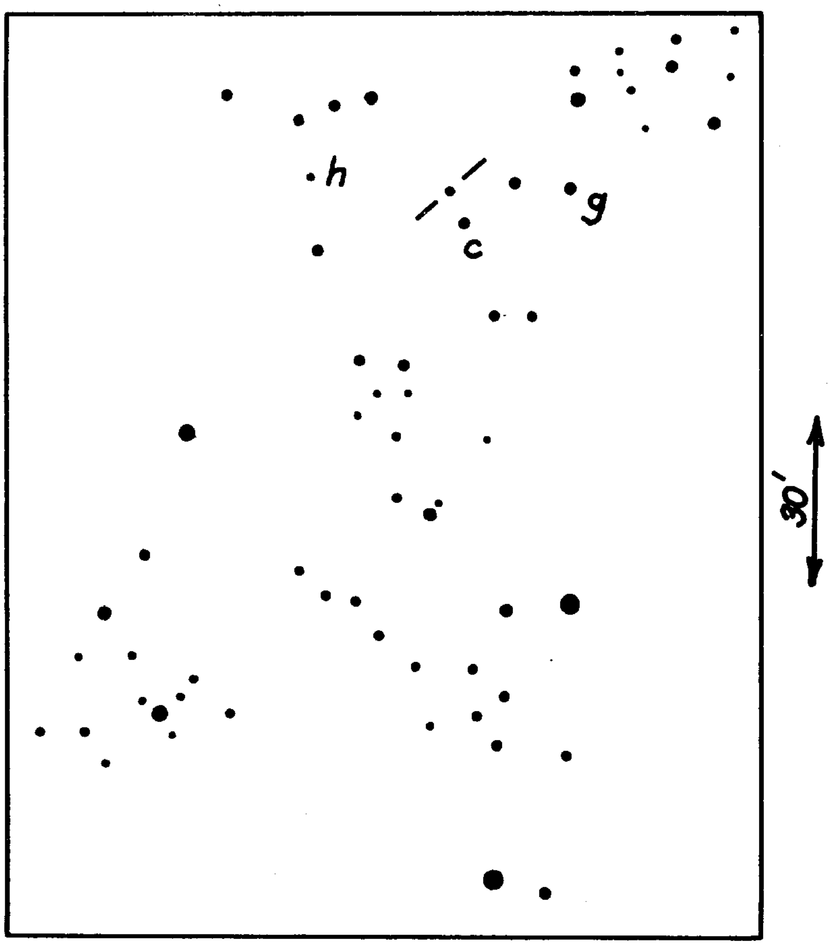
The coordinates of the object are: $\alpha = 1^h13.8^m$ and $\delta = 65^o10.5'$ (1950.0). The identification chart is given in Figure 1. For the measurements (by estimation methods) on the plates, the comparison star g, c and h from Fig. 1 were used; their brightness are linked to the sequence of stars No. 5, 6, 8 and 12 from Gonzáles and Gonzáles (1954) and to the a, b and c stars (the comparison stars for the variable BP Cas) from Solovjev (1951).

The star lies only 14' from the centre, but outside the error circle for the X-ray source 2S 0114+650. The investigation of this possibly new flare star in Cassiopeia was made during the author's visit at the Sonneberg Observatory.

RENÉ HUDEC

Astronomical Institute of the
Czechoslovak Academy of Sciences
Observatory Ondrejov
Czechoslovakia

References:
Gonzáles G. and Gonzáles G.: 1954, Bol. Obs. Tonantzintla-Tacubaya, 1, No. 9, 21.
Solovjev, A.V.: 1951, Peremennye Zvezdy 7, 286.



COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1436

Konkoly Observatory
Budapest
1978 June 12

12.15 MINUTE LIGHT VARIATIONS IN PRZYBYLSKI'S STAR, HD101065

Light variations of amplitude 0.01 to 0.02 mag and period 12.15 minutes have been discovered in the magnetic Holmium star, HD101065.

Observations have been made on 23/24 Apr, 09/10, 13/14, 14/15, and 15/16 May 1978 using the People's Photometer attached to the 0.5 m telescope of the South African Astronomical Observatory (SAAO). Figure 1 shows the observations made on 15/16 May 1978 through a Johnson B filter. Each point represents the extinction corrected magnitude of HD101065 computed from the sum of two 10 second integrations. The slow drift in mean light level is due to change in sky transparency during the observing run.

HD101066 was monitored as a comparison star for 15 minute periods at the beginning and end of each observing run and shows no variations. In addition, observations through a Johnson U filter were obtained by Dr. Gary Wegner simultaneously with the observations shown in figure 1 using the St. Andrews Photometer attached to the SAAO 1 meter telescope. Those U observations also show the 12.15 minute light variability.

A program of monitoring this star photoelectrically is presently in progress. Simultaneous light and radial velocity observations are planned using the People's Photometer on the SAAO 0.5 m telescope and the Speedometer on the 1.88 m SAAO telescope.

D. W. KURTZ

Department of Astronomy
University of Cape Town

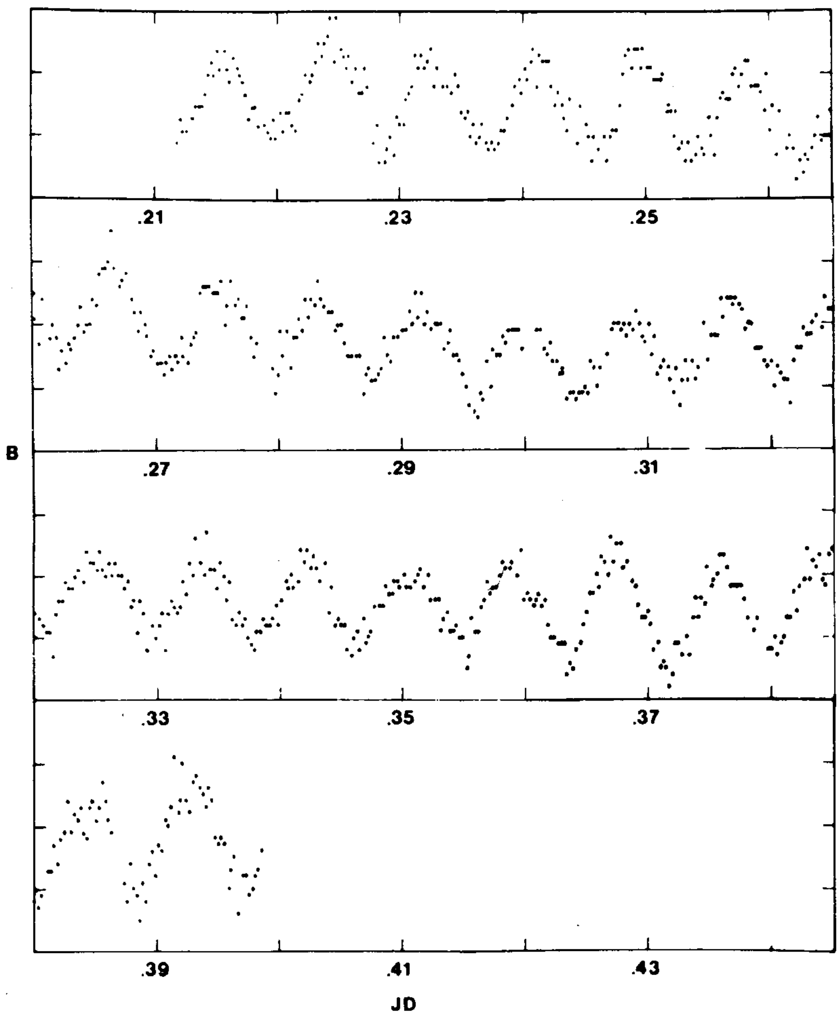


Figure 1

The light curve of HD101065 for 15/16 May 1978. The abscissa is Julian Date - 2443644. The ordinate is the magnitude in Johnson B with tick marks every 0.01 mag. The light curve is continuous from left to right and top to bottom with .005 day overlap from box to box.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1437

Konkoly Observatory
Budapest
1978 June 12

VISUAL OBSERVATIONS OF MIRA TYPE VARIABLE STARS

A total of 3853 visual magnitude estimations by the Argelander step method were made during 1973 and 1977. For 57 stars, 114 times of maximum light and 40 times of minimum light were determined by the Pogson method. The comparison star magnitudes were taken from AAVSO sequences. Refractors of 4", 6" and 12" were used.

Star	φ	Date(J.D.)	Mag.	N	Star	φ	Date(J.D.)	Mag.	N	
R And	M	244 2711^d	6^m1	35	V Cas	m	244 2404^d	12^m2		
	M	3141:	8.0	10		M	2529	7.5	102	
W And	M	3115:	8.3	10		m	2637	12.2		
Y And	M	2642:	9.1	23		M	2760	7.7		
	M	3082	9.4	11		M	2977	7.7		
RR And	M	3061:	9.8:	7		m	3106:	12.0:	62	
TU And	M	2867:	8.0:	22		M	3210	7.8		
R Aql	m	2493	10.5		X Cas	M	3055	10.3	41	
	M	2600	6.1		T Cep	M	2593	6.0		1)
	m	2759	11.2	114		m	2793	10.0	197	
	M	2886	5.8			M	2984	6.4		
	m	3049	11.7			m	3182	9.5		
R Ari	M	2628:	9.1	20	R Cyg	M	2435	6.3	60	
	M	2817:	8.4	18		M	2907	8.9	52	
	M	3005	8.4			M	3310	7.9:	16	
	m	3104	12.5	40	S Cyg	M	2821:	10.6:	8	
	M	3198:	8.4		U Cyg	m	2467	11.7		
R Aur	M	3075:	7.5	11		M	2720	7.3	200	
U Aur	M	2756	8.0	23		m	2962	10.7		
	M	3178:	9.0	15		M	3168	7.1		
RR Aur	M	2718:	9.3:	11	Z Cyg	M	2481	9.2		
	M	3032:	9.5:	16		m	2630	13.2		
R Boo	M	2516	7.1	38		M	2766	9.1	106	
	m	2866:	12.7	45		m	2907:	13.4		
	M	2957	6.8			M	3019	10.0		
S Boo	M	2499	7.7	37		M	3285	9.3	18	
	M	2766	8.4:	25	RT Cyg	M	2501	7.6		
	M	3297:	8.8	20		m	2598	11.8:		
U Boo	M	3253:	10.1:	6		M	2696	7.3		
R Cam	M	2076:	8.5:	25		m	2790:	12.5:	143	
R Cnc	M	2780:	7.3:	23		M	2878	7.9		
V Cnc	M	3198	7.7	17		m	2976	12.7		
R Cas	M	2754	6.9			M	3082	7.7		
	m	2995	13.2	79		M	3264	7.5	20	
	M	3169	6.9		TU Cyg	M	2801	9.3	17	
T Cas	m	2585:	12.3			M	3004:	11.1	22	
	M	2821	7.4	152 1)	X Cyg	M	2550	4.7	60	
	m	3030	12.8			M	2967	5.8	55	
	M	3299	8.2	1)	S Del	m	2510:	11.7	58	
U Cas	M	2688	9.4	16		M	2606	8.9		
	M	2953	8.3	34		M	2895	8.8	21	2)

Star	φ	Date (J.D.)	Mag.	N
S Del	m	244 3042^d	$11^m.7$	21
R Dra	m	2459:	13.0	62
	M	2560	7.8	
	M	2803	7.4	
	m	2948	13.2	66
	M	3049	7.7	
	M	3295	7.5	17
ST Gem	M	2878:	9.4:	23
S Her	M	2900	8.1	39
T Her	M	2660:	8.6	21
	m	2918	12.8	48
	M	2991	8.4	
	M	3322	8.4	12
U Her	M	2956	8.0	26
RS Her	M	2556	7.7	27
	m	2897	12.7	41
	M	2999	7.5	
	M	3212:	7.6	12
RU Her	M	2982	7.8	18
RV Her	M	2878	9.7	17
SS Her	M	2982	8.9:	17
DO Her	M	2944:	10.6	10
R Leo	m	2477	10.1	44
	m	2775	10.1	33
	M	3237:	5.1	20
W Lyr	M	2511	8.1	28
	M	2718	8.2	24
	M	2902	8.0	38
	m	3016:	12.4	18
	M	3103	8.3	13
	M	3295	7.9	19
RS Lyr	M	2611	9.9	13
	M	2922	10.3	19
RU Lyr	M	2522	11.0	18
	M	2893	10.8	25
RY Lyr	M	3057	9.9	10

Star	φ	Date (J.D.)	Mag.	N	
R Oph	M	244 $1862:^d$	$7^m.9$	13	
X Peg	M	3033:	9.3:	12	
Y Peg	M	3038	10.5	9	
R Per	M	2630:	8.3	15	
	M	2826	8.6	20	
	M	3051	9.3	16	
Y Per	M	2747	8.3	47	
	M	3000	8.6	47	
	m	3128	10.7		
R Tri	m	2699	11.9	45	
	M	2822	5.3		
	M	3080	7.0	31	
R UMa	m	2475	12.9	27	
	M	2584:	7.3:	37	
	m	2786:	12.9:	12	
	M	2889	8.0	43	
	M	3199	7.7	21	
S UMa	m	2515	12.0		
	M	2609	8.1		1)
	m	2736	11.8		
	M	2831	7.9	162	
	m	2966	11.9		
	M	3057:	7.3		1)
	m	3204	12.3		
T UMa	M	2527	7.5	51	
	M	2772	7.3	34	
	M	3031	7.7	23	
	M	3300:	7.3	15	
S UMi	M	3288	7.8	20	
U UMi	M	2441	7.8		
	m	2627	11.8		
	M	2768:	7.9	171	
	m	2934	11.6		
	M	3094	7.8		
	m	3264	11.9		
R Vir	M	2526	7.2	22	

M=Maximum, m=Minimum, N=Number of observations, 1) Wave on the ascending branch of the light curve, 2) double maximum

The accuracy of the given times is $\pm 3^d$ or, if signed by a ":", it is $\pm 6^d$. The accuracy of the given magnitudes is $\pm 0^m.1$ or - with a ":" - it is $\pm 0^m.2$.

U. HOPP

Wilhelm - Foerster Sternwarte

Berlin

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1438

Konkoly Observatory
Budapest
1978 June 16

V 1057 CYGNI

This star has been observed since August 1971; visual estimates with my 15-inch reflector. Observations have been made as follows (comparison star, close beside the variable, being taken as 10.9):

1971:	41 observations; mean mag.	10.7
1972:	46	10.8
1973:	14	11.1
1974:	21	11.2
1975:	38	11.3
1976:	32	11.4
1977:	17	11.5

Though the observations are less numerous than is desirable (mainly due to my illness), there seems to be a slow decline. On 1978 January 17 I made the magnitude 11.6. On my next observation, on May 24 1978, the magnitude was found to have fallen to 12.0: a dramatic decline. It was 12.0 on May 25, 11.9 on May 29 and 11.8 on June 2.

If the magnitude of my main comparison star is adjusted from 10.9, these estimates will also need adjusting , but the decline appears to be definite.

PATRICK MOORE

Farthings,
West Street,
Selsey, Sussex

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1439

Konkoly Observatory
Budapest
1978 May 15

THE FAR ULTRAVIOLET SPECTRUM OF THE BINARY SYSTEM EPSILON AURIGAE

Far ultraviolet observations (1250-2000 A) of the eclipsing binary Epsilon Aur have been made on April 19,1978 in the low resolution mode (RP=7 A) with the International Ultraviolet Explorer by M. Hack and P.L. Selvelli. The flux observed at λ 1320 is roughly estimated about 100 times higher and at λ 1500 about 10 times higher than that expected from the FO Ia star. These results indicate the presence of a hot companion of visual magnitude about 10 or 11. The presence of a hot companion was predicted by Hack (1961) for explaining the characteristics of the observed "shell" spectrum during the eclipse of 1955-1957 (Hack, 1959) and attributing the eclipse of the primary to electron scattering from the shell or ring surrounding the hot companion.

MARGHERITA HACK

Trieste Astronomical
Observatory

PIER LUIGI SELVELLI

ESA ground station,
Villafranca del Castillo,
Spain;on leave of absence
from the Trieste Observatory

References:

Hack, M. 1959, Astroph.J. 129, 291

Hack, M. 1961, Mem.Soc.Astron.It. 32, 351

Editor's note: This paper came to the editor's hand on May 15,1978. According to an agreement among NASA SRC and ESA users, however, any data collected with IUE satellite should not have been published before the publication of the results of the science commissioning phase.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1440

Konkoly Observatory
Budapest
1978 June 27

NEW ECLIPSING BINARY SYSTEM HR 3872A

INTRODUCTION:

The discovery of a new eclipsing binary system HR 3872A (V=6.1, Sp.T.= B6V, $\alpha(1950) = 9^h42^m$, $\delta(1950) = -51°$) is the result of a search conducted by the author for Beta Cephei stars among possible candidates in the southern hemisphere. HR 3872A was on the observing program as a comparison star. We did not find in the literature any comments on the optical variability of HR 3872A. However, a variable radial velocity of HR 3872 is noted by Hube(1970). The photometric observations reported here are not sufficient to completely define the system.

OBSERVATIONS:

The observations were obtained through a Strömgren 'v' filter using a 1P21 photometer attached to the 61 cm telescope of the University of Toronto, situated at Las Campanas in Chile. HR 3927 (V = 5.7, Sp.T. = A0, $\alpha(1950) = 9^h53^m$, $\delta(1950) = -50°$) was used as the comparison star. Its constancy has been checked against HR 3955. The observations of Δm_b (HR 3872 - HR 3927) obtained on the five nights in 1976 and on two nights in 1977, are listed in Table 1. HR 3872B (separation = 2.″1 and $\Delta m \approx 5.0$ mag.) was in the diaphragm along with HR 3872A during the observing but we do not think HR 3872B has any connection with the light variation of HR 3872A.

Mr. G. Grieve kindly obtained a spectrogram of HR 3872A for classification purposes, using the same telescope. On the basis of it HR 3872A has been classified by Dr. R.F. Garrison as a B6V star. The spectrum does not show any trace of the other component of the system.

Table 1

Observations of an eclipsing binary HR 3872A.

JD$_\odot$	Δm_b	JD$_\odot$	Δm_b	JD$_\odot$	Δm_b
2440000+					
2858.603	.412	2861.657	.595	2864.705	.422
.614	.414	.668	.590	.749	.448
.632	.410	.670	.588	.785	.440
.685	.415	.692	.591	2877.530	.414
.767	.414	.714	.588	.564	.411
.771	.410	.728	.585	.612	.411
.783	.403	.738	.578	3211.585	.409
2859.517	.400	.754	.572	.614	.415
.536	.406	.768	.554	.652	.416
.555	.407	.776	.542	.707	.409
2861.532	.504	.781	.544	.734	.410
.541	.501	.786	.534	.760	.416
.557	.532	.793	.533	3212.559	.405
.579	.571	.799	.516	.579	.402
.585	.574	2864.517	.399	.613	.410
.591	.576	.576	.402	.672	.412
.622	.586	.622	.407	.719	.423
.634	.591	.656	.411	.752	.420
				.784	.449

Figure 1

A plot of Δm_b(HR 3872-HR 3927) versus JD for three nights in 1976.

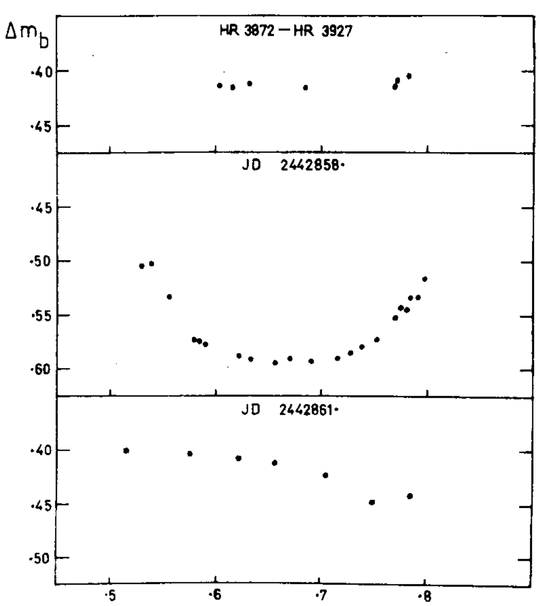


Figure 1 shows a plot of Δm_b versus JD for three nights in 1976. The system went through an eclipse on JD 2442861. It seems to be a primary eclipse particularly if the observations are compared to that of JD 2442864; on which the system seems to have gone through a secondary eclipse. The observations suggest that the eclipses are total and the primary eclipse is an occultation of the B6V component. The time of minimum was JD⊙ 2442864.6697. The observations are not sufficient to deduce the period of the system. From the duration of the eclipse it can be said that the period can not be less than 1.25 days. If a phase difference of 0.5 is assumed between the primary and the secondary minima then the period of the system can be close to either 2 days or 5 days.

Acknowledgements:

I thank Mr. G. Grieve for obtaining the sepctrogram of HR 3872A. Thanks are also due to Dr. R. F. Garrison for classifying the spectrum.

SHYAM M. JAKATE

Department of Astronomy
University of Toronto
Toronto, Ont.
Canada, M5S 1A7

Reference:

Hube, D. P. 1970, Mem. Roy. Ast. Soc. 72, 233

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1441

Konkoly Observatory
Budapest
1978 June 27

RECENT PHOTOMETRY OF OJ287

Quasi-stellar objects of the BL Lacertae class have highly chaotic optical light curves which exhibit detectable variations on time scales of hours, as well as longer term changes. The unravelling of the complex features in the light curves and the development of reliable photometric statistics requires as much optical information as possible. To the end we list in Table 1 sixteen photographic B magnitudes of the BL Lacertae object OJ 287 acquired principally over the past two seasons.

The data were obtained with a Cassegrain camera attached to the 24 inch (60 cm) f/11 reflector at the Optical Observatory of The Pennsylvania State University, using unbaked Kodak 103aO plates and a GG13 filter. Most exposures were 20 minutes long. Calibration was accomplished with the help of the photoelectric standards discussed by Penston and Wing (1973) (Numbers 1 to 6, 10 and 11) and the fainter standard of McGimsey, Miller and Williamon (1976). The paucity of the number of standard sources and the non-linearity of the calibration curves necessitated the use of hand-fitted curves to the data points, since second and higher order least squares fits were underdetermined by nine calibrators. The resulting B magnitudes are given in the Table along with probable errors estimated from the scatter about the calibration curves. Also given are the modified Julian days (= J.D. - 2,400,000) of midexposure and the dates of observation.

Table 1

B	σ	M.J.D.	Date
13.45	0.05	41718.6	Feb. 4/5, 73
13.45	0.05	41718.6	Feb. 4/5, 73
13.55	0.05	41720.6	Feb. 6/7, 73
15.80	0.15	42784.771	Jan. 6/7, 76
16.45	0.10	42866.646	Mar. 28/29,76
16.05	0.10	42892.667	Apr. 23/24,76
15.10	0.10	43228.587	Mar. 25/26,77
15.05	0.10	43228.615	Mar. 25/26,77
15.35	0.10	43242.601	Apr. 8/9,77
15.35	0.10	43242.677	Apr.8/9,77
15.40	0.10	43245.576	Apr.11/12,77
15.40	0.10	43248.556	Apr. 14/15,77
15.50	0.10	43248.576	Apr. 14/15/77
15.50	0.10	43263.573	Apr. 29/30,77
15.45	0.10	43271.590	May 7/8, 77
14.95	0.05	43275.597	May 11/12,77

No evidence for nebulosity was observed in association with any image. The data are in good agreement with the composite light curve of Pollock (1975) and recent observations conducted at the University of Florida Rosemary Hill Observatory.

Of the many goals which exist for optical monitoring of quasars, the establishment of the extremum photometric statistics B_{min} and B_{max}, and characteristic optical time scales τ, is conceivably among the more important. The B magnitude of OJ 287 in Table 1 observed by Pica (1976) on March 28/29, 1976 is thus of some interest. This value of $B = 16.45 \pm 0.10$ is in good agreement with the apparent minimum brightness if $B = 16.33 \pm 0.09$ observed the previous month by Dumortier (1976). It is also comparable to the minimum brightnesses of (i) $B = 16.47$ observed nine years earlier and recorded by Lyuty (1976), and (ii) B = 16.4 recorded by Visvanathan and Elliot (1973) and Pollock (1975) in the 1940's. Thus the well-known outburst which occurred during the past ten years is bracketed by minima that appear to be quite well established.

J. ZINK
A.J. PICA
J.T. POLLOCK
D. KOLPANEN
P.D. USHER

Department of Astronomy
Pennsylvania State University
University Park, Pa. 16802

References:

Dumortier, B., 1976 Thesis, University of Paris

Lyuty, V. M., 1976 Variable Stars 20, 243.

McGimsey, B. Q., Miller, H. R., Williamon, R. M., 1976 Astron. J. 81, 750.

Penston, M. V., Wing, R. F., 1973 Observatory 93, 149.

Pica, A. J., 1976 M.S. Thesis, The Pennsylvania State University.

Pollock, J. T. 1975 M. S. Thesis, The Pennsylvania State University

Visvanathan, N., Elliot, J. L., 1977 Astrophys. J. 179, 721/

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1442

Konkoly Observatory
Budapest
1978 June 27

TIME SHIFT-PERIOD-AMPLITUDE RELATION FOR PULSATION VARIABLES

1. Introduction

The phenomenon, that several pulsation variables show a delay in time (time shift) between the instants of maximum light, as one goes from shorter to longer wavelenghts, is wellknown.
The effect has been observed in AI Velorum stars, β Canis Majoris type pulsators, cepheids and long period Mira stars.
The aim of the present investigation is to find out, if there exist a relation between the mean value of the time shift, the period and the amplitude of a pulsation variable.

2. A linear time shift-period-amplitude relation

From our observations at the European Southern Observatory (ESO), during 1970-1977, we have estimated by means of a cubic spline fit procedure, the instants of maximum light for the pulsation variables SX Phe, AI Vel, ~~V70~~3 Sco and BS Aqr (AI Velorum stars).
By comparing the values of the U and V filter, we were able to deduce a mean value for the time shift between U and V maximum light.
Table 1 gives a review of some intrinsic properties of the investigated stars.

Table 1

Star	Type	Period (min)	Amplitude ΔV (mag)	$P/\Delta V$	Observed mean time shift (sec)		Calc.time shift (sec)
SX Phe	AI Vel	80	0.45	177.8	30	(47)*	30
AI Vel	"	160	0.41	390.2	47	(32)	50
V703 Sco	"	166	0.32	518.7	68	(12)	61
BS Aqr	"	288	0.44	654.5	70	(10)	73

*number of observed maxima

Since we believe, that there exists a linear relation between time shift, period and amplitude, we will write now this relation as follows

$$\text{Time shift (seconds)} = \alpha \times \frac{\text{period (minutes)}}{\text{amplitude V (magnitudes)}} + \beta$$

where α is the slope and β the interception (least square solution).

All observations of Table 1 could be assembled into the following particular TPA relation

$$\Delta T = 0.09056\ P/\Delta V + 14 \qquad (1)$$

where ΔT is the time shift, and the other symbols have their ordinary meaning. The last column of Table 1 shows the calculated value of the time shift with the aid of eq.1.

ERIC W. ELST
Royal Observatory at Uccle

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1443

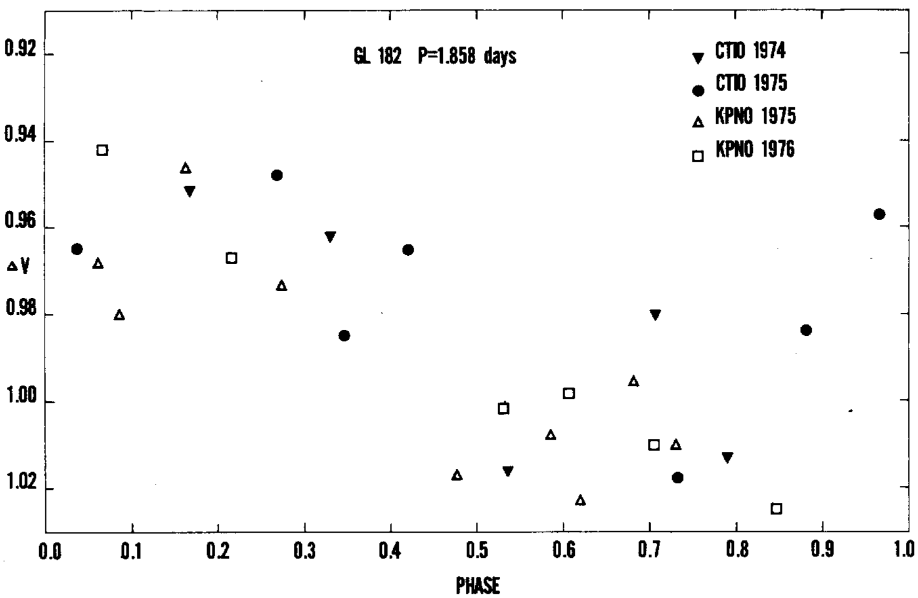
Konkoly Observatory
Budapest
1978 June 28

OBSERVATIONS OF THE BY DRACONIS VARIABLE GLIESE 182

The dMe star Gliese 182 (= Vyss 111) has recently been recognized as a BY Draconis variable by Bopp and Espenak (1977), who noted a range of variation in V of ~0.1 mag, with a period near two days. We report here additional photometry and spectroscopy of GL 182 obtained at CTIO in 1974 and 1975. The available data suggest a provisional rotational period P = 1.858 days for GL 182.

The photometric data consist of fifteen nights of BVr photometry obtained during 1975-76 at KPNO and reported by Bopp and Espenak. In addition, twelve UBVr observations were made at CTIO during 1974-75 by Torres and Busko. These observations were done independently, and by a happy coincidence, the same comparison stars (BD +00°911, +00°915) were used. Table I gives the measured differential magnitudes ΔV, $\Delta(B-V)$ in the sense Gliese 182 minus BD +00°915. Neither of the photometric systems was standard, and some transformation non-linearities were encountered. This may account for the discrepancy of 0.03 mag in the $(B-V)$ colors. We note, however, that the internal consistency of each set of $(B-V)$ colors is good, and no evidence for color changes over the photometric cycle is seen. In both cases, $(V-r)$ colors could not be accurately transformed to the Johnson system, but again neither data set showed significant variability.

The 1974 CTIO data appear brighter than the others by ~0.03 mag, which may reflect a real change in mean light level. For the purpose of the period analysis, we have added 0.028 mag to the 1974 data. Using all the data, we find four periods of almost equal probability: 1.833, 1.858, 2.189 and 2.199 days. Shorter periods, less than one day, do fit the data, but if these were correct, we would expect higher dispersion spectra to show rotationally broadened lines, but no line broadening is evident on 18 Å mm^{-1} spectrograms (Bopp and Fekel 1977). We adopt the provisional period P = 1.858 days, which is satisfied by all the data sets. We assume in this analysis that no changes in phase or period have occurred, which may not be true in general for BY Dra variables (Oskanyan *et al*. 1977). The data are plotted in Figure 1; zero phase is taken arbitrarily as JD 2442000.



GL 182 P=1.858 days
CTIO 1974
CTIO 1975
KPNO 1975
KPNO 1976
0.92
0.94
0.96
0.98
1.00
1.02
ΔV
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
PHASE

TABLE I

HJD 2442000+	ΔV	Δ(B-V)	Observatory
296.890	+0.985*	------	CTIO
297.894	0.934	------	CTIO
316.854	0.988	------	CTIO
319.886	0.924*	------	CTIO
320.887	0.952	------	CTIO
701.823	1.018	+0.239	CTIO
702.819	0.948	0.238	CTIO
704.826	0.985	0.239	CTIO
705.820	0.984	0.243	CTIO
706.816	0.965	0.242	CTIO
707.830	0.957:	0.224:	CTIO
709.824	0.965	0.242	CTIO
719.926	1.017	0.192	KPNO
721.013	0.968	0.202	KPNO
721.993	1.008	0.217	KPNO
722.922	0.980	0.212	KPNO
723.913	1.023	0.232	KPNO
724.921	0.946	0.204	KPNO
725.880	0.995	0.206	KPNO
727.833	1.010	0.211	KPNO
728.843	0.973	0.210	KPNO
829.648	1.002	0.192	KPNO
830.643	0.942	0.208	KPNO
831.646	0.998	0.195	KPNO
833.689	1.010	0.214	KPNO
834.640	0.967	0.203	KPNO
837.667	1.025	0.223	KPNO

*Differential with respect to BD +00°911

In addition, eight image tube spectrograms (dispersion 18 Å mm^{-1}) were obtained at the coudé focus of the CTIO 1.5 m reflector in 1974. The spectrograms record the Hα region, and reveal significant night-to-night variations of the Hα emission strength, but no correlation with the photometric period is apparent. The Li I λ6707 feature can be seen as a relatively strong absorption line, confirming the observations of Bopp (1974).

Gliese 182 continues to be an intriguing BY Dra star: with no radial velocity variations evident, it is an apparently single star, yet its equatorial rotational velocity, assuming a two day rotational period, is ~15 km s^{-1}, remarkably high for a single late-type dwarf. The presence of the Li I feature might suggest extreme youth, yet Gliese 182 is apparently not a member of any young cluster and is kinematically unremarkable.

B. W. Bopp acknowledges support from a University of Toledo Faculty Research Award and NSF Grant AST 77-09540.

B. W. BOPP
Ritter Observatory
University of Toledo
Toledo, OH 43606

C.A.O. TORRES,* I. C. BUSKO,* AND G. R. QUAST
CNPq - Observatorio Nacional
Rio de Janeiro - BRASIL

*Visiting Astronomer, CTIO.

References:

Bopp, B. W. 1974, P.A.S.P., 86, 281.
Bopp, B. W., and Espenak, F. 1977, Astron. J., 82, 490.
Bopp, B. W., and Fekel, F. 1977, Astron. J., 82, 916.
Oskanyan, V. S., Evans, D. S., Lacy, C., and McMillan, R. S. 1977, Astrophys. J., 214, 430.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1444

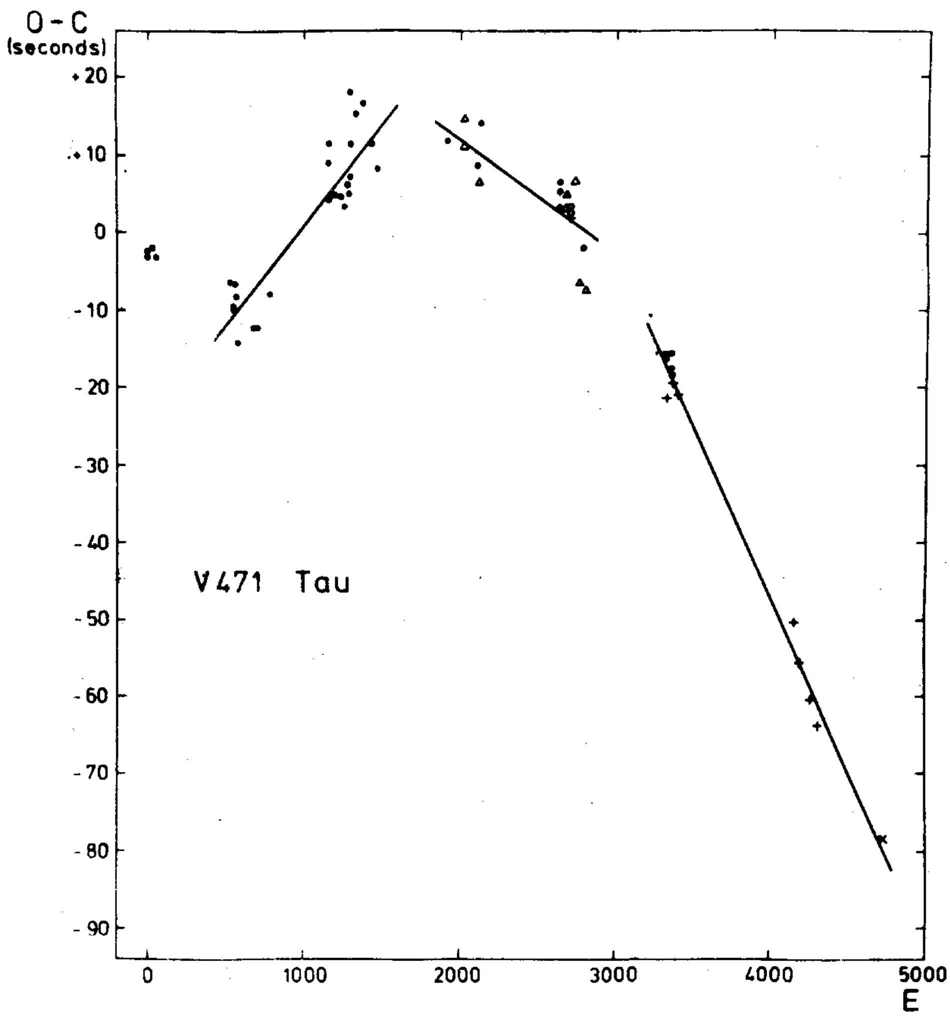
Konkoly Observatory
Budapest
1978 June 28

A DISCUSSION OF PERIOD CHANGES IN THE WHITE DWARF ECLIPSING BINARY SYSTEM V471 TAURI

Times of minimum have been obtained for the white dwarf eclipsing binary system V471 Tauri (BD+16°516) between 1973 and 1976. Seven eclipses were observed with the 76.1 cm telescope of the Rosemary Hill Observatory (RHO) and four with the No.4 40.6cm telescope of the Kitt Peak National Observatory (KPNO). The data are listed in Table 1 where the modified Julian Date (as defined by: MJD = JD - 2400000.5) of mid-eclipse is given as well as the O-C in seconds of time. The O-C's were computed from the light elements of Young and Lanning (1975) transformed to modified Julian Date: 40609.56490 + 0.52118346·E.

Plotted in Figure 1 are the O-C's from Table 1 (crosses) as well as those from Lohsen (1974) - open circles, Young and Lanning (1975) - dots, and Cester and Pucillo (1976) - triangles. The times of minima obtained by Ibanoglu (1976) have not been plotted because they were published to 0.001 day. Similarly, the average O-C has been plotted for the four new times obtained with the small telescope at KPNO.

It is apparent in Fig.1 that the period of V471 Tau has changed more than once since its discovery in 1969. Young and Lanning suggested that the changes were due to mass loss or mass transfer in the binary system. Herczeg (1975) objected on the grounds that the system is detached with no other evidence for mass flow. He suggested a light-time effect in an eccentric orbit around a third body. The trend of the recent O-C's in Figure 1 indicates that if there is a light-time orbit, its period is greater than the five years suggested by Herczeg. It should be noted that Herczeg's objection to mass flow may not be entirely valid: there are a number of binary systems in which large scale mass flow is suspected even though the systems are detached, e.g. the


O - C
(seconds)
+20
+10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
V471 Tau
0
1000
2000
3000
4000
5000
E

RS Canum Venaticorum systems.

From Figure 1 we see that since epoch 3500 the period has been relatively constant. It appears simplest to assume a period change at about epoch 1500 followed by a second change at about epoch 3000. (Apparently there was an earlier change just after the discovery of the system but there is too little information available for much discussion of this event.) We have fitted three straight lines to the available O-C's as indicated in Fig.1. The coefficients of these lines and the resulting linear light elements are given in Table 2. The third segment (C) should be useful for prediction of eclipses in the near future. For prediction of the first contact, 0.01699 day should be subtracted from the predicted time of mid-eclipse.

The O-C diagram consisting of linear segments would imply rather short time intervals when the period was changing separated by longer intervals of period constancy. Unfortunately, the time scales of the period changes can not be estimated from the available material because there are not enough timings at intervals when the linear segments join together. We can obtain the upper limit to such a time scale, however, assuming that the segment B is actually parabolic, implying a continuous period change between segments A and C. The time-scale (e-folding time) of the period change estimated in that way is 2×10^6 years. Such a time-scale, being comparable to the thermal time scale of the KOV component, suggests that this component (and its variable moment of inertia in particular) might cause the period changes observed in V471 Tauri.

We wish to thank Dr. Cafer Ibanoglu for kindly sending us some of his data in advance of publication. Partial support of this research came from NSF grant INT 76-80588. JPO wishes to thank Professor S.L. Piotrowski for his kind hospitality at the Warsaw University Observatory. Dr. T.R. Flesch assisted with the observations at Rosemary Hill Observatory. The observations at Kitt Peak National Observatory were obtained when SMR held the Research Associateship of the NRC of Canada. Computations for this paper were made on the PDP 11/45 computer of the N. Copernicus Astronomical Center in Warsaw.

Table 1

Site	UT Date	t_{mid} (MJD)	Epoch	O-C (seconds)	
RHO	30 Nov 73	42016.23908	2699	+ 1.9	
RHO	26 Oct 74	42346.14794	3332	-21.5	
RHO	2 Dec 74	42383.15197	3403	-21.1	
RHO	22 Dec 75	42768.30621	4142	-50.2	
RHO	11 Jan 76	42788.11112	4180	-55.5	
RHO	17 Feb 76	42825.11509	4251	-60.4	
RHO	11 Mar 76	42849.08949	4297	-63.7	
KPNO	26 Oct 76	43077.3678	4735	-68	
KPNO	27 Oct 76	43078.4100	4737	-82	-78.5
KPNO	28 Oct 76	43079.4523	4739	-88	
KPNO	29 Oct 76	43080.4948	4741	-76	

Table 2

Segment	Range in Epoch	Linear O-C Fit	Linear Light Elements (MJD)
A	500-1800	$-24^{s}.7+0^{s}.0259\times E$	$40609.56462+0.52118376\times E$
B	1800-3000	$+42.3-0.0151\times E$	$40609.56539+0.52118329\times E$
C	3000-5000	$+131.2-0.0445\times E$	$40609.56642+0.52118294\times E$

J.P. OLIVER
Rosemary Hill Observatory
University of Florida

S.M. RUCINSKI*
Warsaw University Observatory
and
Dominion Astrophysical Observatory,
Victoria

References:

Cester, B. and Pucillo, M. Astron.& Astrophys., 46, 197, 1976

Herczeg, T. IBVS No. 1076, 1975

Ibanoglu, C. IBVS No. 1088, 1976

Lohsen, E. Astron. & Astrophys., 36, 459, 1974

Young, A. and Lanning, H. Publ. Astron. Soc. Pacific, 87,461,1975

*Visiting Astronomer, Kitt Peak National Observatory, which is operated by the Association of Universities for Research in Astronomy, Inc., under contract with the National Science Foundation.

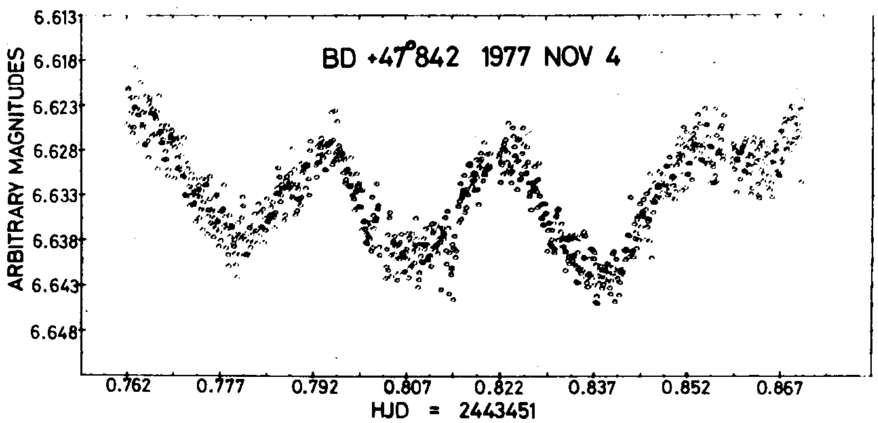
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1445

Konkoly Observatory
Budapest
1978 July 3

BD+47°842 - AN ULTRASHORT PERIOD δ SCUTI VARIABLE

In a recent survey of the α Persei cluster to detect small amplitude variables, three new such variables were discovered which are members of the cluster, as reported by Slovak (1978). These variables were classified as δ Scuti pulsators, falling within the confines of the δ Scuti instability strip and displaying the short period, small amplitude variations which characterize the class. Of particular interest is BD+47°842 (V = 8.78, B-V = +0.28; A3V), the hottest pulsator to be discovered in the α Persei cluster, which is found to fall nearly on the blue edge of the instability strip. An analysis of the 1975 -1976 differential data has revealed this variable to be multi-periodic, having a "fundamental" period of $P_o \approx 0\overset{d}{.}070$ and an "overtone" period of $P_1 \approx 0\overset{d}{.}030$.

In order to achieve higher time resolution, BD+47°842 was examined in 1977 November using a two channel high speed photometer which continuously samples the program star in the first channel and a suitable comparison star in the second channel. The light curve obtained in this fashion on 1977 Nov 4 is shown in the accompaning figure. The data were obtained on the 76-cm telescope of the McDonald Observatory; each point represents the average counting rate (in instrumental magnitudes) obtained in unfiltered light over a 10 s integration period. The data have been corrected for the sky background and extinction, using a mean coefficient of $\bar{k}_{vis} = 0.350$. Clearly visible in the light curve are two nearly symmetrical pulsations with a peak-to-peak amplitude of $\approx$ 0.017 mag, having a mean period of $0\overset{d}{.}0295$ = 42.5 minutes. Thus, the "overtone" period P_1 has



been present in BD+47°842 for at least two years, revealing it to be a remarkably stable pulsator. For study of similar short period δ Scuti variables, the application of the technique of high speed photometry , as opposed to the classical method of differential photometry, promises to be a powerful tool for defining the exact nature of the complicated light curves of these complex stars.

MARK H. SLOVAK
Department of Astronomy
University of Texas

JOHN AFRICANO
McDonald Observatory
University of Texas

Reference:

Slovak, M. H. 1978, Ap. J., in press.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1446

Konkoly Observatory
Budapest
1978 July 3

PECULIARITIES OF SOME β LYRAE-TYPE STARS AND THE NEED OF THEIR FURTHER INVESTIGATION

During recent years an extensive study of β Lyrae-type binaries was performed in order to study mass transfer between the components. As change in the orbital period is one of the important features of the systems in which mass transfer occurs we performed a study of this phenomenon. As a result of our research several O - C diagrams were constructed and the parabolic shape of the O - C curve was found. This suggests monotonous mass transfer when mass loss from the system is not taken into consideration. In some cases short term or secular deviations from this course may exist. This gives evidence for nonstationary processes in mass transfer. As the study of nonstationary processes in the evolution and physics of β Lyrae-type stars is very important, we prepared a list of those stars with peculiarities in the shape of the O - C curve. The list below contains some of the β Lyrae-type stars on the northern hemisphere brighter than ca 11th magnitude in maximum light with observed irregularities of period change. The Table also includes some stars for which reliable data do not exist. For the investigation of the system the photoelectric observations of times of minimum are highly desirable.

Table 1

Star name	Range of the light variations	Period	Reason for the investigation
DS And	10.8 - 11.4	$1\overset{d}{.}010$	Gaps in the observations. Light curve and elements desirable
V 337 Aql	8.7 - 9.7	2.734	Massive components, variations in the light curve.

Table 1 (cont.)

V 609 Aql	11.7 - 12.4	0.797	Change in period ? Gap in the observations
AP Aur	10.9 - 11.4	0.569	Large changes in period ?
EP Aur	10.8 - 11.3	0.591	Shortening of period
TX Cas	9.2 - 9.8	2.927	Period changes ? Gap in the observations
IR Cas	10.8 - 12.1	0.681	Large change in period ?
QQ Cas	10.5 - 11.1	2.142	Period variations
WY Cep	10.7 11.6	1.249	Gap in the photoelectric observations
XZ Cep	8.4 - 9.2	5.970	Gap in the observations
AH Cep	6.9 - 7.1	1.775	Large changes in the period
CQ Cep	8.9 - 9.4	1.621	WR component
EY Cep	10.1 - 10.7	5.517	No photoelectric observations
V 366 Cyg	10.0 - 10.5	1.096	Gap in the observations
V 367 Cyg	7.4 - 8.0	18.597	Important from the point of evolution
V 388 Cyg	9.7 - 10.3	0.859	Great period change
V 680 Cyg	10.2 - 10.9	1.199	Period not correct. No phe observations
V 729 Cyg	10.6 - 10.9	6.598	Asymmetry of the light curve
V 885 Cyg	9.9 - 10.3	1.695	Gap in the observations
RZ Dra	10.0 - 10.9	0.551	Period change. Asymmetry of the light curve. Secular terms in O-C curve ?
TT Her	9.7 - 10.5	0.912	Shortening of the period
VY Lac	10.2 - 11.0	1.036	Changes in the period started recently ?
AW Lac	10.6 - 11.3	1.143	Gap in the phe observations
TZ Lyr	10.4 - 11.4	0.529	Change in the period

Table 1 (cont.)

AN Tau	10.3 - 11.2	1.615	Large change in the period ?
V Tri	10.9 - 11.9	0.585	No phe observations
AG Vir	8.8 - 9.4	0.643	Changes in the period. Asymmetry of minima
AX Vir	10.3 - 10.9	0.703	Few observations

J.M. KREINER

Astronomical Laboratory
Institute of Physics
Silesian University
Katowice, Poland

J. TREMKO

Astronomical Institute of the
Slovak Academy of Sciences
Tatranska Lomnica
Czechoslovakia

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1447

Konkoly Observatory
Budapest
1978 July 3

NEW Hα-EMISSION STARS IN THE REGION OF NGC 7000

During July and August 1977 the search for Hα-emission stars in the region of NGC 7000 was continued with the 40"/52" Schmidt-telescope of the Byurakan Astrophysical Observatory.

Ten spectral plates have been obtained by a 4° objective prism (275 A/mm at Hα) on Kodak II F emulsion through an RG 610 filter. The exposure times were between 20 sec and 100 min. In order to reach the highest limiting magnitude the spectra were not widened. The plates were hipersensitized by baking in dry air from 56°C to 70°C during 12 - 14 hours according to the method of Stepanian and Amirhanian (1977). The average limiting magnitude was about 19^{m} (pg) for the exposure time of 60 min.

19 new Hα-emission stars have been found which were not on the lists of Merrill and Burwell (1949, 1950), Herbig (1958), Welin (1973) and Tsvetkov (1975).

The data of observed new Hα-emission stars are presented in Table 1.

Table 1

Designation	RA 1950.0	D 1950.0	B_p	$I_{H\alpha}$
1	$20^h41^m.0$	$41^{\circ}11'$	$14^m.8$	3
2	41.2	43 13	19.1	4
3	41.4	42 36	18.3	3
4	42.9	43 44	14.5	4
5	44.9	41 48	16.1	2
6	47.0	43 32	20.5:	4
7	47.0	43 40	18.1	5
8	47.4	41 30	14.0	2
9	48.4	43 31	17.3	3
10	49.0	44 40	20.5:	4
11	49.6	44 02	20.5:	4
12	50.4	42 01	15.8	4
13	50.9	42 54	15.0	3
14	51.0	44 14	15.3	3
15	51.4	43 33	19.0	4
16	53.0	43 59	19.4	3
17	53.0	44 01	17.6	3
18	56.5	43 42	19.7	3
19	58.6	41 24	19.6	4

Column 1: Serial numbers of Hα-emission stars.

Columns 2 and 3: Coordinates for 1950.0.

Column 4: Photographic magnitudes measured on the POSS blue prints (B_p) according to the method of stellar diameters.

Column 5: Intensity of Hα-line in emission: 5-very strong, 4-strong, 3-medium, 2-weak.

The Hα-emission star No 1 in this list was discovered by Tsvetkov et al. (1975) as a flare star No. B19.

A more detailed study including the identification charts of the Hα-emission stars discovered will be published later on.

The authors thank Prof. L.V. Mirzoyan and Dr. M.D. Popova for helpful discussions and Mr. A. Amirhanian for the aid in the observations.

M.K. TSVETKOV, K.P. TSVETKOVA

Department of Astronomy
Bulgarian Academy of Sciences

References:

Herbig, G.: 1958, ApJ. 128, 259.

Merrill, P.W., Burwell, C.G.: 1949, ApJ, 110, 387.

Merrill, P.W., Burwell, C.G.: 1950, ApJ, 112, 72.

Stepanian, J.A., Amirhanian, A.S.: 1977 (private communication)

Tsvetkov, M.K.: 1975, Astrofizika, 11, 579.

Tsvetkov, M.K., Erastova, L.K., Tsvetkova, K.P.: 1975, IBVS, No. 1002.

Welin, G.: 1973, Astron. Astrophys. Suppl. 9, 183.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1448

Konkoly Observatory
Budapest
1978 July 27

COMMISSION 27 REPORT 1976-78

It is now high time to start preparations for the Commission 27 Report to be included in the forthcoming Volume of the IAU Transactions. After collecting views, opinions, and suggestions from members of our Commission after consulting with members of the Commission's Organizing Committee, I have prepared the following proposal.

The Report will consist of a series of reviews covering organizational problems and selected research areas. The Authors will have freedom of choice between:

A. conventional presentation, with an emphasis on completeness of the survey and references, or

B. critical review, or an essay, with an emphasis on the most important and prospective aspects and trends.

The list of topics and Authors is given below. To ensure the completeness of the Report and to meet the deadlines, I should like to ask all active workers in the field to send immediately and directly to the relevant Co-Authors their reprints, preprints, abstracts, or other information on current research.

J. SMAK, President
Commission 27 of the IAU

Commission 27 Report 1976-78

Topic:	Author:
General, meetings, catalogs, books, organizations problems	J. Smak
Archives of unpublished pe observations and related problems	M. Breger
General Catalogue of Variable Stars	M.S. Frolov
Surveys	W. Wenzel
Red Variables	M.W. Feast
Cepheids	R.S. Stobie
RR Lyrae Variables	B. Szeidl
βCMa Variables	J. Rountree-Lesh
δSct and Dwarf Cepheids	M. Breger
Magnetic Variables and Related Objects	K. Stępień
T Tau Variables and Related Objects	G.T. Gahm
Flare Stars	P.F. Chugainov
Variable White Dwarfs	E.L. Robinson
Novae at Outbursts	E.R. Mustel and V.P. Arkhipova
Supernovae	G.A. Tammann
Theory of stellar pulsations	A.N. Cox
Accretion phenomena in Variable Stars	G.T. Bath

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1449

Konkoly Observatory
Budapest
1978 July 27

PHOTOELECTRIC MINIMA OF ECLIPSING BINARIES

The following Table gives photoelectric minima obtained during the year 1977 at the Ege University Observatory, Izmir (Turkey) and the Nürnberg Observatory (Germany). Minima of eclipsing binaries observed at both observatories 1960-1976 were published in Astr.Nachr. 288, 69 (1964); 289, 191 (1966); 291, 111 (1968); IBVS 456 (1970), 530 (1971), 647 (1972), 937 (1974), 1053 (1975), 1163 (1976) and 1358 (1977).

The Table gives the heliocentric minima, two different O-C's, the number of measurements, the type of filter, UBV or by (intermediate band photometry of Strömgren), the abbreviations of the names of the observers and the type of the instruments used (Izmir: 48 cm Cassegrain, Nürnberg: 34 cm Cassegrain, both with phototube 1P21).

Abbreviations of the observers' names:

Ad = A. Durgut	Kt = M. Kurutac
Be = G. Besold	Me = T. Mertelmeier
Bl = A. Blenner	Nc = N. Damla
Bo = G. Bode	Rd = E. Roderer
Eb = J. Ebersberger	Si = B. Schieweck
Er = A.Y. Ertan	Sn = S. Evren
Es = E. Hamzaoglu	Sr = C. Sezer
Gr = R. Gröbel	Tm = O. Tümer
He = W. Hetterich	Tn = Z. Tunca
Ib = C. Ibanoglu	

Remarks:

O-C (I) : GCVS, Moscow 1969/70 or First or Second or Third Supplement to the Third Edition of the GCVS. Moscow 1971, 1974 and 1976

O-C (II) : SAC 49, Krakow 1977

The (O-C)'s for secondary minima (Min II) were calculated on the supposition that they are symmetric between primary minima (if no special data are given).

m: only the elements I or the elements II give secondary minimum.

The sign = between O-C (I) and O-C (II) indicates that the elements (I) and (II) are equal.

Star	Min.hel. 2443	O-C(I)	O-C(II)	n	Filt.	Obs.	Instr.	Rem.
RT And	381.5065	-0.0140	-0.0170	18	-	Gr	34	
AB And	481.4057	+0.0039	+0.0040	28	V	Gr	"	Min II
OO Aql	370.4473	+0.0008	+0.0139(m)	35	V	Gr	"	
RX Ari	398.4376	+0.0040	-	16	b	Tm	48	
WW Aur	477.3949	-0.0004	-0.0033	18	V	Bo/Eb	34	
BF Aur	389.5005	+0.0069	-0.0019	14	b	Tm	48	
	389.5026	+0.0090	+0.0002	15	y	Tm	"	
	408.4991	+0.0069	-0.0019	24	b	Tm	"	
TV Cas	442.3897	-0.0150	-0.0170	11	b,y	Sr/Tm/Nc	"	
DO Cas	408.3972	-0.0042	+0.0012	32	b	Tm/Sn	"	
	425.5148	-0.0033	+0.0021	24	V	Tm	"	
	425.5155	-0.0026	+0.0028	24	b	Tm	"	
	501.5126	-0.0035	+0.0020	62	B,V	Tm/Sn	"	
	502.1960	-0.0048	+0.0007	26	V	Tm/Kt/Es	"	
	502.1967	-0.0041	+0.0014	26	B	Tm/Kt/Es	"	
VW Cep	312.4522	-0.0085	+0.0010	18	V	Gr/Si	34	
	378.4148	-0.0068	+0.0032	20	y	Tm/Es/Sn	48	
EG Cep	288.5002	+0.0016	+0.0129	24	V	Bo/Eb/Gr	34	Min II
836 Cyg	393.4388	+0.0033	+0.0018	35	V	Gr	"	Min II
AI Dra	242.4739	+0.0042=	+0.0042	25	B	Er/Tn/Tm/Sn	48	
	242.4749	+0.0032=	+0.0032	25	V	Er/Tn/Tm/Sn	"	
	386.3335	-0.0025=	-0.0025	26	y	Er/Tm/Sn	"	
BS Dra	291.4469	-0.0008	+0.0053	25	V	Be/Eb/Rd	34	
	333.4971	-0.0008	+0.0055	12	V	Gr/Eb	"	Min II
YY Eri	398.5500	-0.0098	+0.0034	12	b	Tm	48	Min II
AK Her	266.3964	-0.0043=	-0.0043	14	B	Er/Sn	"	
	266.3971	-0.0036=	-0.0036	14	V	Er/Sn	"	
DI Her	296.4789	+0.0074	+0.0062	26	V	Eb/He	34	Min II
SW Lac	398.4899	-0.0265=	-0.0265	22	V	Gr	"	
CM Lac	368.4957	+0.0004=	+0.0004	16	V	Gr	"	
	389.3542	-0.0020=	-0.0020	43	y	Tm	48	
UV Leo	266.3058	-0.0069	+0.0055	18	B	Er/Sn	"	Min II
	266.3065	-0.0062	+0.0062	18	V	Er/Sn	"	Min II
AM Leo	218.3973	-0.0031	-0.0123	19	V	Bo/Eb	34	
502 Oph	238.525	-0.004	+0.001	25	B	Er/Tm/Sn	48	
	238.524	-0.005	+0.000	25	V	Er/Tm/Sn	"	
	292.4761	-0.0069	-0.0013	23	V	Be/He/Rd	34	

Star	Min.hel. 2443	O-C(I)	O-C(II)	n	Filt.	Obs.	Instr.	Rem.
RT And	381.5065	-0.0140	-0.0170	18	-	Gr	34	
AB And	481.4057	+0.0039	+0.0040	28	V	Gr	"	Min II
OO Aql	370.4473	+0.0008	+0.0139 (m)	35	V	Gr	"	
RX Ari	398.4376	+0.0040	-	16	b	Tm	48	
WW Aur	477.3949	-0.0004	-0.0033	18	V	Bo/Eb	34	
BF Aur	389.5005	+0.0069	-0.0019	14	b	Tm	48	
	389.5026	+0.0090	+0.0002	15	y	Tm	"	
	408.4991	+0.0069	-0.0019	24	b	Tm	"	
TV Cas	442.3897	-0.0150	-0.0170	11	b,y	Sr/Tm/Nc	"	
DO Cas	408.3972	-0.0042	+0.0012	32	b	Tm/Sn	"	
	425.5148	-0.0033	+0.0021	24	V	Tm	"	
	425.5155	-0.0026	+0.0028	24	b	Tm	"	
	501.5126	-0.0035	+0.0020	62	B,V	Tm/Sn	"	
	502.1960	-0.0048	+0.0007	26	V	Tm/Kt/Es	"	
	502.1967	-0.0041	+0.0014	26	B	Tm/Kt/Es	"	
VW Cep	312.4522	-0.0085	+0.0010	18	V	Gr/Si	34	
	378.4148	-0.0068	+0.0032	20	y	Tm/Es/Sn	48	
EG Cep	288.5002	+0.0016	+0.0129	24	V	Bo/Eb/Gr	34	Min II
836 Cyg	393.4388	+0.0033	+0.0018	35	V	Gr	"	Min II
AI Dra	242.4739	+0.0042=	+0.0042	25	B	Er/Tn/Tm/Sn	48	
	242.4749	+0.0032=	+0.0032	25	V	Er/Tn/Tm/Sn	"	
	386.3335	-0.0025=	-0.0025	26	y	Er/Tm/Sn	"	
BS Dra	291.4469	-0.0008	+0.0053	25	V	Be/Eb/Rd	34	
	333.4971	-0.0008	+0.0055	12	V	Gr/Eb	"	Min II
YY Eri	398.5500	-0.0098	+0.0034	12	b	Tm	48	Min II
AK Her	266.3964	-0.0043=	-0.0043	14	B	Er/Sn	"	
	266.3971	-0.0036=	-0.0036	14	V	Er/Sn	"	
DI Her	296.4789	+0.0074	+0.0062	26	V	Eb/He	34	Min II
SW Lac	398.4899	-0.0265=	-0.0265	22	V	Gr	"	
CM Lac	368.4957	+0.0004=	+0.0004	16	V	Gr	"	
	389.3542	-0.0020=	-0.0020	43	y	Tm	48	
UV Leo	266.3058	-0.0069	+0.0055	18	B	Er/Sn	"	Min II
	266.3065	-0.0062	+0.0062	18	V	Er/Sn	"	Min II
AM Leo	218.3973	-0.0031	-0.0123	19	V	Bo/Eb	34	
502 Oph	238.525	-0.004	+0.001	25	B	Er/Tm/Sn	48	
	238.524	-0.005	+0.000	25	V	Er/Tm/Sn	"	
	292.4761	-0.0069	-0.0013	23	V	Be/He/Rd	34	

Star	Min.hel. 2443	O-C(I)	O-C(II)	n	Filt.	Obs.	Instr.	Rem.
566 Oph	281.5037	+0.0355	+0.0141	24	V	Bl/Gr/Si	34	
IZ Per	386.4696	+0.0193	+0.0193	35	y	Er/Tm/Sn	48	
β Per	442.2895	+0.0002	-0.0070	25	B	Sr/Tm/Nc	"	
HU Tau	400.5010	-0.0081	+0.0070	17	b,y	Tm/Ad	"	Min II
471 Tau	460.4160	-0.0010	-	18	B	Ib	"	
	462.5008	-0.0010	-	13	B	Kt	"	
	463.5432	-0.0010	-	48	B	Kt	"	
W UMa	250.4456	+0.0039	-0.0076	20	V	Me/Si	34	
	273.2998	+0.0040	-0.0076	11	B,V	Er/Sn	48	Min II
	499.3410	+0.0061	-0.0064	13	V	Be/Eb	34	
W UMi	392.4936	-0.0250	-0.0278	21	b	Tm/Sn	48	
DR Vul	268.5528	+0.0509	+0.0483	24	B	Tn/Tm	"	Min II
	268.5535	+0.0516	+0.0490	24	V	Tn/Tm	"	Min II

J.EBERSBERGER, E. POHL
Nürnberg Observatory
Regiomontanusweg 1,
85 Nürnberg, F.R.G.

A. KIZILIRMAK
Ege University Observatory
Bornova/Izmir P.K.21, Turkey

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1450
Konkoly Observatory
Budapest
1978 July 28

HR 4511 - A POSSIBLE VERY LONG-PERIOD CLASSICAL CEPHEID IN THE CLUSTER STOCK 14

It has been stated in the literature that HR 4511 (=HD 101947) shows slight variations in the optical lightcurve (e.g. Fernie, 1977) and in some spectral lines, especially Hα (e.g. Bidelman et al., 1963).

We have carried out an extensive program at the European Southern Observatory at La Silla, Chile, obtaining photometry, spectrum scans, polarization measurements and coudé-spectra, partly through the kind cooperation of several colleagues.

From our reductions the following can be stated now:

- HR 4511 shows a lightcurve similar to the one presented by van Genderen and Thé (1978) for Tr 27-102
- The period is estimated to be of the order of 125 days
- We find amplitudes of $0^m_{\cdot}17$ in u, $0^m_{\cdot}24$ in v, $0^m_{\cdot}16$ in b, and $0^m_{\cdot}13$ in y, but they may be slightly larger
- The spectral type is GO Ia
- Most of the Hα-profiles we obtained show central emission
- It is a member of the loose open cluster Stock 14 (Moffat and Vogt, 1975)

Our results are consistent with the concept of an extremely long-period low amplitude classical cepheid. These cepheids are very difficult to find and until today no cepheid of such a long period is known in our Galaxy. Also because of its cluster membership HR 4511 may be of great importance in cepheid research. It would therefore be of great value if observers in the southern hemisphere could continue the study of this star. Our full results have been submitted to Astronomy and Astrophysics, but are in the meantime available on request.

W. EICHENDORF
Astronomisches Institut
Postfach 102148
D-4630 Bochum 1
Fed. Rep. of Germany

BO REIPURTH
Copenhagen University
Observatory
Øster Voldgade 3
DK-1350 Copenhagen K
Denmark

References:

Bidelman, W.P. et al.: 1963, Publ.Astron.Soc.Pacific 75, 524
Fernie, J.D.: 1977, I.B.V.S. No. 1305
Moffat, A.F.J., Vogt, N.: 1975, Astron.Astrophys.Suppl.20, 125
van Genderen, A.M., Thé, P.S.: 1978, Astron.Astrophys.64 L1

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1451

Konkoly Observatory
Budapest
1978 July 28

NOUVELLES RECHERCHES DE PÉRIODES D'ÉTOILES Ap OBSERVÉES À L'ESO.-II

Les variations photométriques en uvby pour une nouvelle série d'étoiles Ap (cf. IBVS 1391) ont été recherchées en novembre 1977, avec le photomètre à 4 canaux attaché au télescope danois situé à l'ESO. En vue de la détermination des périodes, les résultats ont été analysés par la même méthode (P. Renson, Astron.& Astrophys. 63, 125, 1978) que les séries précédentes, ce qui a conduit aux valeurs ci-dessous. (La grandeur de la variation est chaque fois déterminée à 0.005 mag près au mieux : par exemple 0.035 signifie entre 0.03 et 0.04 environ).

Etoile	type spectral	grandeur de la variation(mag) y	b	v	u	période
HD 12767=ν For	A0pSi	0.02	0.03	0.035	0.025	1.89±0.02
HD 22470=20 Eri	B9pSi	0.055	0.06	0.06	0.11	1.93±0.03
HD 29009=46 Eri	B9pSi	0.035	0.04	0.045	0.065	3.82±0.04
HD 29305=α Dor	A0pSi	0.04	0.04	0.03	0.10	2.95±0.04
HD 35548=HR 1800	B9pHgMn	~0	~0	~0	~0	-
HD 36916	B8pSiMn	0.045	0.065	0.065	0.085	1.564±0.007
HD 37808=HR 1957	B9pSi	0.02	0.03	0.03	0.04	1.099±0.004

L'intervalle de temps pendant lequel les observations ont été faites est de 19 à 20j, sauf pour ν For (14,2j) et HR 1800 (14j). Le nombre d'observations est supérieur a 30 pour chaque étoile, sauf ν For (26) et HR 1800 (21). Chaque observation est comme d'habitude constituée d'une série de mesures suivant le schéma C_1-Ap-C_2-Ap-C_2-Ap-C_1, où Ap représente l'étoile dont on cherche les variations, et C_1 et C_2 les deux étoiles de comparaison. Pour 46 Eri, les mesures de C_2 ont été éliminées dans l'analyse des résultats, car ceux-ci montrent que cette étoile, HD 28843=HR 1441, est variable.

L'absence de variation significative pour HR 1800 peut être interprétée soit par le fait que sa période est très longue vis-à-vis de la durée de la mission, soit par le fait qu'elle ne varie effectivement par ou pratiquement pas; il est d'ailleurs connu qu'on ne trouve en général guère de variations pour les étoiles Hg-Mn, contrairement aux étoiles au Si.

Trois des étoiles observées montrent des variations relativement grandes pour des étoiles Ap: 20 Eri, α Dor et HD 36916.

Comme c'est le plus souvent le cas, toutes les étoiles ont une plus grande variation en u que pour les trois autres couleurs, à l'exception de ν For, où la variation est plus grande en v (la courbe en u tend à présenter une double vague). Comme c'est aussi généralement le cas, les courbes obtenues ne sont pas sinusoidales, les écarts a l'harmonicité étant souvent très marqués.

Plus de détails sur ces observations et les graphiques seront donnés ailleurs, avec ceux qui concernent les étoiles observées en juillet de la même année.

P. RENSON

Institut d'Astrophysique
de l'Université de Liège
B-4200 Cointe-Ougrée (Belgique)

J. MANFROID

ESO, CH-1211 Genève 23 (Suisse)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1452

Konkoly Observatory
Budapest
1978 July 31

ON THE PERIOD OF RY SCUTI

The unusual eclipsing system RY Scuti, one of the few radio binaries, was for decades a rather neglected object. It was believed that its period was not constant, but the nature of the period changes--as Wenzel and Gessner recently (1977) pointed out--remained to a large extent unknown. The method of estimating the minimum epoch from isolated "faint observations" is obviously of very little avail, as a plot of the data from the table of these authors illustrates. They addressed the owners of other plate collections to try to fill the gaps.

The University of Oklahoma plate collection contains 198 plates taken by Professor B. S. Whitney with the 85 mm Zeiss astrograph which show the variable. The observing seasons 1948 (with 1949), 1955, 1957 and 1958 are well represented and allow the construction of mean light curves and the derivation of normal minima. The plates were measured with the Coffey iris photometer using a blue photometric sequence, derived earlier by Professor Whitney from 14 comparisons with the NPS.

Normal epochs for these years are given below.

(1)	Min. I = JD 2432796.445		O-C = $+0\overset{d}{.}006$
(2)	35366.218		O-C = -0.082
(3)	36078.080		O-C = -0.216
(4)	36433.91	:	O-C = -0.39 :

The last epoch is of much less weight, since its value hinges mainly on two plates taken near $\phi = 0.86$. The O-C values are calculated from Gaposchkin's elements (1937):

$$\text{Min. I} = 2427979.34 + 11\overset{d}{.}124939 \cdot E$$

The figure shows these O-C values (against Gaposchkin's formula) together with other normal epochs. We omitted all times of minima derived from "faint observations", even if based on scattered photoelectric data. The last point corresponds to a set of photoelectric observations made in Catania and published in a preliminary form (Ciatti et al. 1977); we incorporated the observed phase shift -0.06 P into the figure, by tentatively substituting JD 244297 (Aug. 6, 1976) for the expression "during summer 1976." The agreement with the adjacent Sonneberg normal epoch of the minimum is quite satisfactory.

There still exists a gap of about 15 years between the Oklahoma observations and the more recent ones, but the two groups of minimum epochs can be remarkably well represented by a single linear formula:

$$\text{Min. I} = \text{JD } 2432796.477 + 11\overset{d}{.}124138 \cdot E$$

(after JD 2432000)

The corresponding O-C values are tabulated below.

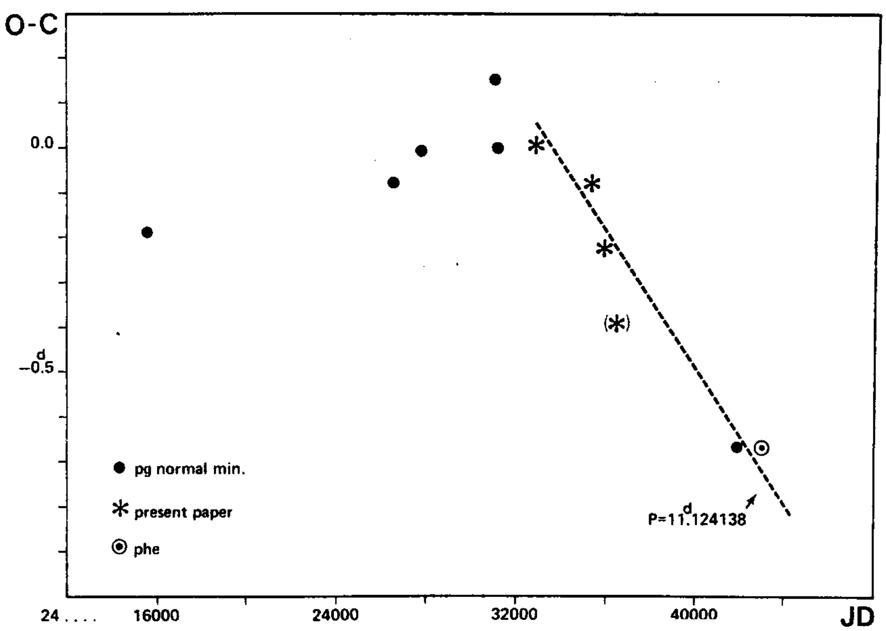
E = 0	O-C = $-0\overset{d}{.}032$	Oklahoma min. no. 1
E=231	+0.065	no. 2
E=295	-0.018	no. 3
E=814	O-C = $-0\overset{d}{.}045$	Sonneberg, normal min.
E=917	+0.030	Catania, phe

This representation suggests that

1. the period of RY Scuti seems to have shown relatively little change during the past 30 years;

2. there was a marked change (decrease) of the period some time around 1938-1942. The derived amount of the period variation depends crucially on the early observations discussed by Gaposchkin (l.c.). Taken these residuals at face value the net change of the period between 1900 and 1975 turns out to be of the order of $-0\overset{d}{.}00104$ or -90 sec. It is, however, nearly impossible to tell whether this change occurred instantaneously or by continuous decrease.

A mean light curve for the years 1948-1960 shows a wide scatter of about 0.25 magn.; this is almost certainly due mainly to changes in the light curve. While the depth of primary minimum did not show conspicuous variations, its shape varied noticeably, especially in 1957 when it was much narrower than usual (see also O'Connell 1949).



R. A. BRADY and T. J. HERCZEG

Department of Physics and Astronomy
University of Oklahoma
Norman, Oklahoma

References:

(1) Ciatti, F., A. Mammano, R. Margoni, A. Vittone and G. Strazzulla, 1977: Bamberg Veroeff. 11, No. 121, p. 386.

(2) Gaposchkin, S., 1937: Harvard Obs. Ann. 105, p. 511.

(3) O'Connell, D.J.K.S.J., 1949: A.J. 54, 134.

(4) Wenzel, W. and H. Gessner, 1977: IBVS No. 1276.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1453

Konkoly Observatory
Budapest
1978 July 31

SPECTRAL INFORMATION ON VARIABLE STARS

I have recently systematically searched our objective prism plate collection for certain stars having no spectral types, or uncertain ones, listed in the General Catalogue of Variable Stars, 3rdedition (GCVS) through the Third Supplement, and having quoted magnitudes at maximum brighter than 11.0 either photographically or visually. The stars were chosen to be non-eclipsing and,further, not to be types of variables for which the spectral type is fairly predictable; the most numerous exclusion in the latter category were Cepheid variables and RR Lyrae stars. A few suspected novae were included, and stars given in several recent lists of spectral types were excluded with occasional exceptions. South of declination -30° our plate collection is confined to within about 10° of the Galactic equator.

Within the stated limitations, we had plates covering about 75% of the positions. The identifications on the plates were made with the aid of computer-generated overlays. From extensive experience with these overlays I find that, for positions of the usual GCVS accuracy and stars bright enough to be shown on our plates, the overlays are entirely satisfactory at our plate scale of 97"/mm. They would have been unreliable in crowded star clusters - I did not actually encounter any - on account of the spectral overlaps, which however also render star charts equally difficult to use.

About 45% of the stars were not seen on the plates, and were presumably too faint at the plate epochs. The missed stars include the two suspected novae covered, viz. SY Gem and SZ Per.

A few of these stars do have published spectral types, traced by me through W.P. Bidelman's card file. Where I have been able to add something from our plates, these stars are retained here in Tables II and III. Several stars were thus discarded and this, with a few additions from variables outside the quoted magnitude limit that were encountered accidentally, leaves 29 stars in this note.

In Table I, the columns headed "Type of plate(s)" indicates the types of plates I have used, as follows. b, conventional blue spectral region, spectral dispersion at Hγ 280 or 580 A/mm. r, red region from 6800A shortward to at least 5800A and sometimes to 5000A, dipersion at Hα 1000 A/mm. These plates are quite useful for distinguishing between M stars and S stars. i, infrared, 6800A to 8800A, 1700 A/mm at λ7600. These plates do not distinguish between M stars and the weaker S stars, as illustrated by V865 Aql in Table III.

Table I. New Spectral Types

Star	Spec.	Type of plate(s)	Notes	Star	Spec.	Type of plate(s)	Notes
AA Cap	M5	b		UW Oph	M7	i	
SV Car	M9	r		V345 Ori	M3	r	
AD Cir	M5	b,r		FF Peg	M5	r	
CT Cyg	M7	i		TU Pup	M8	r	
DU Cyg	M4	b		V3828 Sgr	M4	r	
RX Del	M2e	b		YY Sco	M7e	b	2
VV Her	M7	i		LR Sco	Fp	b	3
W Lup	M4	r		TX Vel	G5	b	
TW Lyr	M6	b		DM Vel	M6	b,r	
Y Mus	Fp	b	1	HH Vul	M3	r	4
IS Nor	B4	b					

Notes to Table I:

1. (Y Mus.) Hydrogen-deficient. At 580 A/mm the spectrum is identical to that of R CrB near typical maximum.
2. (YY Sco.) Emission strong, with Mira-type distorsion of the Balmer decrement.
3. (LR Sco.) The 580 A/mm spectrum seems identical to that of R CrB at maximum. This is remarkable, since the variability type has been considered to be SR on the basis of magnitude determinations at more than a hundred epochs.
4. (HH Vul.) Spectrum K - M in GCVS

Table II. Additional Information for Known Spectral Types

Star	GCVS Spec.	Remarks
V403 Cas	F9:	Spectrum confirmed, but notably red for the type.
S Crv	*	GCVS notes that Miss Cannon called this star M8 in a Harvard Bulletin,but F5 in a Yale zone catalogue. Hansen and Blanco, Astron.J.<u>80</u>,1011, give M5 from an infrared objective prism plate. It is at the plate limit of a blue-region 280 A/mm Case plate, where it is M5.
T Crv	-	M6 by Hansen & Blanco in the reference just cited. Mira-type hydrogen emission on a Case plate.
FQ Sgr	-	M8 by Hansen & Blanco; same remark as for previous star.

Table III. Remarks on Some Further Published Types not in the GCVS.

Star	Remarks
FP Aql	M3e by Nassau <u>et al</u> in Astrophys.J.<u>139</u>,864. A 2'+error in our measured declination is apparently why this paper did not identify with FP Aql originally. A further red plate - the original was blue - shows M8.
V865 Aql	M6 by Hansen and Blanco from an infrared objective prism plate, and this is its appearance on a comparable plate of my own, but it is a somewhat weak S star according to Keenan,Astrophys.J.<u>120</u>, 484, as mentioned in my <u>General Catalogue of S Stars</u>. The GCVS type of S ? is probably from the Dearborn survey.
V840 Cyg	Case plates show that this is star 28^{o}3 (A1 II) in <u>Luminous Stars in the Northern Milky Way, II</u>. Perhaps even more luminous on my plate.
V1125 Cyg	This star would be HD 184128 (Mb)= Dearborn 17840 (M5). I too make it about M5 on a blue plate, and note a similarly bright A0: star about 100" to the south.

C.B. STEPHENSON

Warner and Swasey Observatory

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1454

Konkoly Observatory
Budapest
1978 August 3

NEW FLARE STARS IN THE PRAESEPE-REGION

In the course of searching for flare stars in the Praesepe-Region 20 plates have been obtained by the method of multiple exposures, with the 60/90/180 cm Schmidt-telescope at Konkoly Observatory between 1977 November and 1978 April.

We used Kodak 103aO plates with 2 mm Schott UG 2 filter, each exposition was 10 min.

Table I gives the data of three new flare stars, which were discovered during 19.3 hours of effective coverage:

Table I

Designation	RA	D	m_{pg}	Δm_u	Date of flare-up
K6	$8^h30^m.7$	$19^\circ 56'$	$18^m.8$	$3^m.8$	07.11.1977
K7	33.0	19 38	17.8	3.1	03.03.1978
K8	42.3	20 28	16.7	1.5	03.03.1978

There have also been registrated two repeated flare-ups on the stars No T4 and No T12 of Haro's list. Some data of these outbursts are given in Table II.

Table II

Designation	RA	D	m_{pg}	Δm_u	Date of flare up
T4	$8^h34^m.8$	$18^\circ 48'$	$20^m.0$	$5^m.4$	03.03.1978
				6.4	04.03.1978
T12	8 25.9	19 45	13.0	2.1	04.03.1978
				2.7	31.03.1978

The tables give the following data:

Column 1: the serial number for the flare stars, found in the Praesepe region at Konkoly and Tonantzintla Observatories, respectively.

Column 2 and 3: The approximate coordinates for 1900.0

Column 4: the approximate photographic magnitudes at minimum light

Column 5: the observed amplitude of the flare-up in U-band.
Column 6: the date of the flare-up.

I. JANKOVICS
Konkoly Observatory
of the Hungarian
Academy of Sciences

K.P. TSVETKOVA
M.K. TSVETKOV
Department of Astronomy
Bulgarian Academy of
Sciences

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1455

Konkoly Observatory
Budapest
1978 August 3

FLARE STAR OBSERVATIONS IN THE PLEIADES REGION

We have continued the survey for flare stars in the region at the Pleiades cluster in 1977.

The observations have been carried out with the 60/90/180 cm Schmidt telescope of the Konkoly Observatory. The method of observations was the common one of multiple and equal exposures of 10 minutes in U-band.

The effective coverage of these observations was 26.7 hours. Four new flare stars have been discovered and eight of the already known flare stars showed flare repetitions.

Table I gives some data of the discovered new flare stars: the first column gives the serial number; column two and three the approximate coordinates for 1900.0, column four the approximate minimum brightness in U-band; column five the observed amplitude of the flare-up in U-band; column six the date of the flare-up.

Table I

Designation	RA	D	m_u	Δm_u	Date
1*	$3^h33^m.4$	$23^\circ 11'$	$16^m.8$	$2^m.5$	05.11.1977
2	36.5	22 16	18.6	2.1	12.12.1977
3	39.1	24 08	17.6	2.0	07.11.1977
4	44.1	22 10	18.9	3.5	11.12.1977

*The flare star No.1 in the Table I is probably identical with the star No.308 of the Byurakan list.

The data for the registered flare repetitions of the already known flare stars are presented in Table II. The Byurakan designation was used and the Hertzsprung numbers are also given.

Table II

Designation						
No.	H II	RA	D	m_u	Δm_u	Date
3		$3^h36^m.7$	$23^\circ41'$	$18^m.6$	$2^m.5$	07.11.1977
55	2411	43.7	24 01	16.8	1.8	08.11.1977
68	134	37.7	23 55	16.8	0.7	07.11.1977
107	2208	43.3	24 15	17.0	1.5	11.12.1977
109	2927	45.1	24 26	16.2	2.8	08.10.1977
157	2144	43.1	23 26	17.6	2.1	07.11.1977
233		46.2	25 50	18.5	3.7	07.11.1977
334	1280	41.1	23 51	16.8	1.5	07.11.1977
					4.5	07.11.1977

I. JANKOVICS
Konkoly Observatory
of the Hungarian
Academy of Sciences

G.B. OGANJAN
Byurakan Observatory

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1456

Konkoly Observatory
Budapest
1978 August 3

FLARE STAR OBSERVATIONS IN THE PLEIADES-REGION

Three new flare stars and five outburst repetitions of the Pleiades-region flare stars were discovered during 14^h10^m of effective observational time on the plates obtained with 60/90/180 cm Schmidt telescope at Konkoly Observatory in the period from 1975 to 1978.

The observations were made on Kodak 103 aO emulsion using Schott UG 2 or UG 1 filter. In most cases we have 6 exposures of 10 min on each plate.

In Table I the first column gives the serial number for the new flare stars found, columns two and three - coordinates for 1900.0, in the fourth column we give the approximate photographic magnitude at minimum light, column five presents the observed amplitude of the flare in U-band and column six the date of the flare-up.

Table I

No	RA	D	m_{pg}	Δm_u	Date of flare-up
1	$3^h38^m.5$	$25^o25'$	19.0	3.2	12.12.1977
2	41.8	24 35	20.3	4.9	30.12.1975
3	50.7	24 48	15.5	1.6	31.10.1975

The data for the observed flare-ups of the known flare stars is presented in the Table 2. We have used the Byurakan designation and the Hertzsprung numbers.

Table II

Designation No	HII	RA	D	m_{pg}	Δm_u	Date of flare-up
21	1653	$3^h42^m.0$	$24^o25'$	14.6	1.6	31.10.1975
72		38.3	23 18	18.4	3.1	30.10.1975
103		36.9	23 08	16.2	0.7	07.11.1977
271	1485	41.9	24 35	15.2	0.6	08.11.1977
478		44.4	23 01	18.7	5.4	04.03.1978

I. JANKOVICS
Konkoly Observatory
of the Hungarian
Academy of Sciences

M.K. TSVETKOV
K.P. TSVETKOVA
Department of Astronomy
Bulgarian Academy of
Sciences

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1457

Konkoly Observatory
Budapest
1978 August 4

PHOTOELECTRIC EPOCH OF MINIMUM LIGHT, V566 OPHIUCHI

V566 Ophiuchi (BD+5°3547, HD 163611) is a contact binary system which undergoes complete eclipses. Secondary eclipse is total. Bookmyer (P.A.S.P. 88, 473, 1976) noted that the period had increased after being constant for at least 11 years and that there were small variations in the shape of the light curve.

The present observations were made on the night of 11-12 June 1978 with the 0.5 m Cassegrain telescope at Palomar Observatory. The photometer housed standard B,V filters and a 1P21 photomultiplier refrigerated with dry ice. A digital counter was used for the intensity measurements, and the time of each observation was obtained from a strip chart tracing. A WWV receiver was utilized to calibrate the chart. BD+4°3553 was used as a comparison star, and no corrections were made for differential extinction.

The measurements yielded 46 observations with the B filter and 70 with the V filter, with each observation being the average of two consecutive ten-second integrations. The primary eclipse curve is well defined by the observations. An epoch of minimum light, JD Hel. Min. I = 2443671.8964, was determined by the method of bisecting chords connecting points of equal magnitude on the opposing branches to find the temporal mean. A residual of $+0^{d}.0390$ was calculated from the ephemeris given by Bookmyer (A.J. 74, 1197, 1969), JD Hel. Min. I = 2436744.4200 + $0^{d}.40964091$ E. This represents an increase in the O-C values since the studies by Bookmyer (1976) and Dawson and Narayanaswamy (P.A.S.P. 89, 47, 1977).

It is important that the period behavior of V566 Oph be followed and that additional light curves be observed and compared with earlier observations.

WILLIAM C. MADDOX
BEVERLY B. BOOKMYER
Dept. of Physics and Astronomy
Clemson University
Clemson, S.C. 29631 USA

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1458

Konkoly Observatory
Budapest
1978 August 14

OBSERVATIONS OF CG CYGNI

BVR photoelectric observations of the eclipsing binary CG Cyg (B.D. +34° 4217) were taken during the first two weeks of July 1978 at the Kottamia station of Helwan Observatory (Egypt). The equipment and photometric arrangements are essentially the same as referred to by Sadik (1978). Two stars in the neighbourhood of the variable were selected as comparison and check stars. They are designated (a) and (b) respectively in the field map given by Yü (1923). The phases were computed using the light elements E = 2439425.1221 and $P = 0\overset{d}{.}6311410$.

CG Cyg has been listed by Hall (1976) in the table of short period group of his paper on the RS CVn binaries. The spectral type of this star is G9V-IV (composite spectrum) and H and K emission lines have been observed in the spectrum. The variability of the star was discovered by A. Stanley Williams in 1905, whose visual light curve (Williams, 1922) suggests irregularities outside of eclipses. Photographic observations were published by Milstein and Nicolajev (1940) and Tsesevich (1954). The photographic light curve of CG Cyg published by Yü (1923) shows the system to be generally brighter near the secondary eclipse than the primary (i.e., a normal "reflection effect") and also the system is brighter following the primary minimum than after the secondary. UBV photoelectric data by Milone (1969a,b) reports asymmetries in the light curve maxima which undergo some kind of long term variation.

Preliminary B and (B–V) curves of our observations are shown in the diagrams below. It is remarkable that the system appears to be brighter near the primary eclipse than near the secondary. This effect is more pronounced in B than the V and R light curves. The observed effect seems to contradict the normal reflection effect in close binaries; though it is possible that it could be explained in terms of the "wave migration" discussion of Hall. A possibly similar star is BH Vir which has also been recently observed at Kottamia and is being examined at the present time.

D. M. Z. JASSUR

Department of Astronomy,
University of Manchester,
Manchester, England.

References:

Hall, D. S. 1976, Proc. of I.A.U. Coll. No. 29 (Budapest), part 1, p.287, Reidel, Dordrecht.

Milone, E F. 1969a, in Non-Periodic Phenomena in Variable Stars, L. Detre, ed. (Budapest: Academic Press), p.457.

Milone, E. F. 1969b, Inf. Bull. Var. Stars, No. 373.

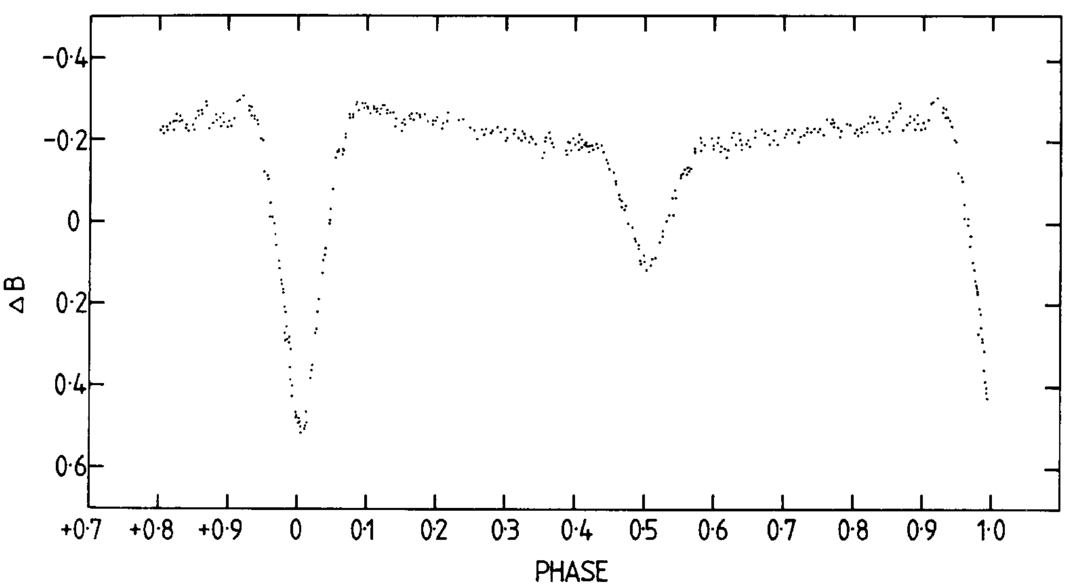
Milstein, I. P. and Nicolajev, S. P. 1940, Bull. Vses. Astr.-Geod. Soc. No. 6,9.

Sadik, A. R. 1978, Inf. Bull. Var. Stars, No. 1381.

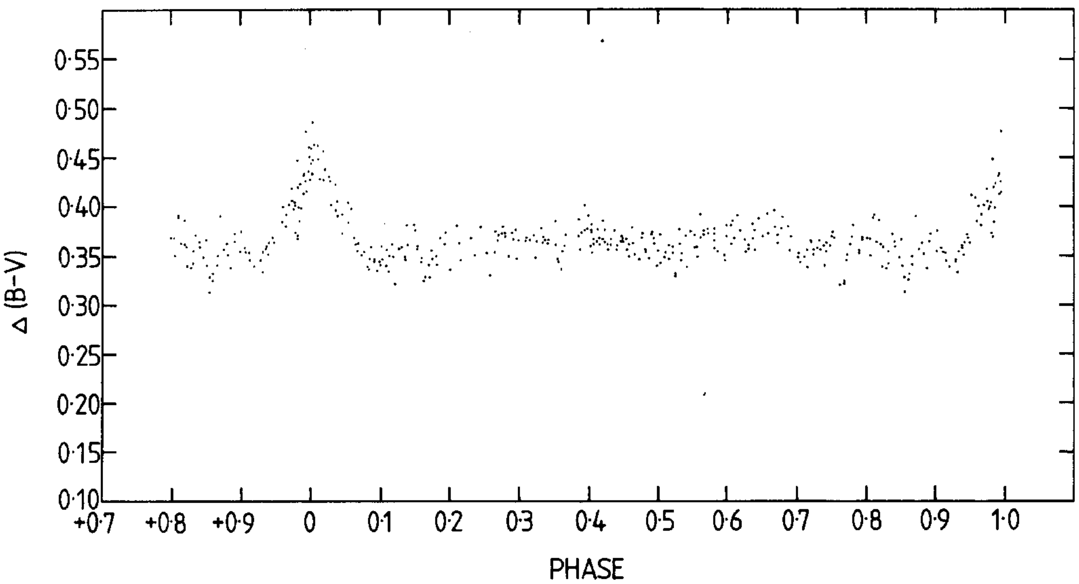
Tsesevich, V. P. 1954, Odessa Izv. 4, 255.

Williams, A. S. 1922, M.N.R.A.S., 82, 300.

Yü, C. -S. 1923, Ap. J., 58, 75.



B Light Curve Of CG CYG.



B−V Light Curve Of CG CYG.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1459

Konkoly Observatory
Budapest
1978 August 16

HR 5110: A NEW VARIABLE STAR

We obtained photoelectric photometry of the bright ($V=5^m.0$) non-eclipsing RS CVn binary HR 5110 (=HD 118216) to see if there is a distortion wave in its light curve. We did discover it to be a variable star, but the light variation was very small, $\Delta V=0^m.010$. Ironically, we are probably not seeing a distortion wave afterall but rather just the familiar reflection effect.

Relevant recent references on HR 5110 are Conti (1967), Popper and Ulrich (1977), and Eggen (1978). Because we expect a light variation in a short period binary to be a function of orbital phase, we computed phases with the ephemeris

$$\text{JD (hel.)} = 2,417,021.60 + 2^d.6131738 \cdot E. \qquad (1)$$

The initial epoch here is a time of conjunction with the F-star behind and the K-star in front; it was derived from the time of periastron given by Harper (1938). The orbit is not necessarily eccentric, because the eccentricity is within one standard deviation of zero. The period is the value derived recently by Conti (1967).

On 54 different nights between 1-2 March and 23-24 June 1978, we obtained a total of 181 differential magnitudes at 6 different observatories. Several nights were observed at more than one observatory. A tally is given below, where n is the number of individual observations and m is the number of nights.

Observatory	Aperture	n	m
Dyer	24-in.	38	14
Kitt Peak	16	28	12
Hickox	10	33	10
Landis	8	32	12
Louth	11	42	26
Schlegel-McHugh	20	8	4

Most of the observations were made in one color (V of the UBV system) and were made differentially with respect to the same comparison star (25 CVn, including the faint visual companion 1.5 arcseconds away). All individual differential magnitudes were corrected for atmospheric extinction with mean extinction coefficients and transformed to the UBV system with known transformation coefficients and a mean value of $\Delta(B-V)$ between the variable and the comparison. Then we formed normals of all those observations made at one observatory on one night.

The normals were analyzed separately in two groups: the first two observatories in Group A and the last four observatories in Group B. Group A included observations between JD 2,443,606.8 and 2,443,673.7; Group B included observations between 2,443,569.7 and 2,443,683.7. The light was expressed as a truncated Fourier series,

$$\ell = A_0 + A_1\cos\theta + A_2\cos 2\theta + B_1\sin\theta \ , \qquad (2)$$

with $\ell = 1$ fixed at $\Delta V = 0\overset{m}{.}145$. The resulting coefficients and their errors are given below.

	Group A	Group B
A_0	1.0012 $\pm$0.0006	1.0019 $\pm$0.0010
A_1	-0.0040 $\pm$0.0009	-0.0051 $\pm$0.0016
A_2	-0.0016 $\pm$0.0009	-0.0001 $\pm$0.0014
B_1	-0.0024 $\pm$0.0008	-0.0001 $\pm$0.0014
θ(min.)	$0\overset{p}{.}08$ $\pm$0.03	$0\overset{p}{.}00$ $\pm$0.05
ΔV(max. to min.)	$0\overset{m}{.}010$ $\pm$0.002	$0\overset{m}{.}011$ $\pm$0.003
ΔV at $\ell = A_0$	$+0\overset{m}{.}1437$ $\pm$0.0006	+0.1429 $\pm$0.0010

Also given are (1) the value of θ(min), the phase of the minimum of the distortion wave /although in this case we do not believe it is a distortion wave/, (2) the value of ΔV, the amplitude of the wave from maximum to minimum, in magnitude units, and (3) the mean magnitude, ΔV at $\ell = A_0$.

Although the variation we have found is quite small, total amplitude only $0\overset{m}{.}010$, we believe it is real because the agreement between Groups A and B so close. Notice that the amplitude, the mean magnitude, and θ(min) all agree within their respective errors.

Because the variation has its maximum so near the phase when the facing hemisphere of the cooler star is towards earth, we are most probably seeing the differential reflection effect. It should be mentioned that there is some question about the constancy of the orbital period, with Harper (1938) having found $2^{d}.61312$ and $2^{d}.61314$ at two different epochs and Conti (1967) having derived $2^{d}.6131738$ at a later epoch. The accumulated effect of a $0^{d}.00002$ or $0^{d}.00003$ error in equation (1) would produce an uncertainty of $\sim 0^{p}.1$ in our phases.

Although HR 5110 has never been listed as a variable or suspected variable in any of the editions of the General Catalogue of Variable Stars or its supplements, we point out that the 3 values of V listed in the U.S. Naval Observatory UBV Catalogue show a range of $0^{m}.05$. Therefore HR 5110 perhaps ought to be reobserved from time to time in case a distortion wave of variable amplitude does exist and we happen to have observed it at minimum amplitude.

DOUGLAS S. HALL
GREGORY W. HENRY*
CHRISTOPHER A. VAUCHER

Dyer Observatory
Vanderbilt University
Nashville, Tennessee 37235

HOWARD LOUTH

2199 Hathaway Road
Sedro Woolley, Washington 98284

LARRY P. LOVELL

Hickox Observatory
18410 Munn Road
Chagrin Falls, Ohio 44022

HOWARD J. LANDIS

2395 Wood Hill Lane
East Point, Georgia 30344

PETER BROOKS
RALPH SCHLEGEL
RICK WASATONIC

Schlegel-McHugh Observatory
East Rock Road
Allentown, Pennsylvania
18103

(*) Guest Investigator, Kitt Peak National Observatory, operated by the Association of Universities for Research in Astronomy, Inc., under contract with the National Science Foundation.

References:

Conti, P.S., 1967, Ap.J. 149, 629
Eggen, O.J., 1978, I.B.V.S. No. 1426
Harper, W.E., 1938, P.D.A.O. 7, 141
Popper, D.M. and Ulrich, R.K., 1977, Ap.J. 212, L131

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1460

Konkoly Observatory
Budapest
1978 August 18

ON THE PERIOD CHANGE OF CEPHEID BD +56°2806

The history of investigation of the star BD +56°2806 is short. Fernie and Hube (ApJ 168, 437, 1971) discovered that it is located on the H-R diagram in the instability strip or near it. Percy (IBVS No.983, 1975) made 6 BV-observations and ranked BD +56°2806 in cepheids with period about 3^d. Using 28 BV-observations Szabados (IBVS No. 1107, 1976) confirmed that this star belonged to the cepheids and derived $P = 2^d.80591$.

Our photographic light estimates (a total about 1200) from Dushanbe, Odessa and Moscow plates led to the detection of a large period change (Figure 1). The period variation during 1940-1975 may be represented by instantaneous elements:

JD 2400000 +	Max JD 2400000 +	P	
29160-34300	30615.57	$2^d.80511$	(1)
35310-40885	35749.12	2.80556	(2)
42020-42790	42676.397	2.80618	(3)

or by progressive increase at the mean rate $\left(\frac{\Delta P}{P}\right)_{100}=0.001$.
E and O-C of the normal moments of light maxima in Table 1 and Figure 1 are calculated from the elements (2).

Let us attract attention to the single point at E=-6922 on the O-C diagram. 13 light estimates in the interval JD 2414663-18235 which form this point do not allow miscalculation of epochs. This conclusion follows from the fact that these estimates are not brought together to a sufficient mean light curve with either $P=2^d.80463$ or $P=2^d.80494$ which should occur in the case of epoch miscalculation either at parabolic or linear O-C variations, respectively. $P=2^d.80556$ gives a sufficient mean light curve.

The form of the light curve (Figure 2) and a large period change characterize BD +56°2806 as the star W Vir. Then taking their luminosity from Kukarkin-Rastorguev's P-L relation and using Parengo's method of the interstellar absorption correction with Sharov's parameters revised we derive the intrinsic colour $(B-V)^{o}_{med}=0\overset{m}{.}64$. V_{med} and $(B-V)_{med}$ were taken from Szabados (1976).

We conclude that BD +56°2806 is very similar to the W Vir star - AU Peg (Erleksova, in press in Variable Stars) with the following characteristics: P value, smallness of light amplitude, smallness of light curve asymmetry, large $(B-V)^{o}_{med}$, unusual P behaviour. The latter is in the fact that the constancy of P during early epochs is interrupted sudden decrease, then P begins its rapid progressive increase. Both stars are of interest from the point of view of stellar evolution, since both stars are on the red edge of the instability strip and show rapid progressive increase in their periods.

I should like to thank Prof. V.P. Tsessevich and Dr. A.S. Sharov for providing oppurtunity to use Odessa plates and light estimates from Moscow plates.

G.E. ERLEKSOVA
Dushanbe Astrophysical
Institute of Tadjik Academy
of Sciences, USSR

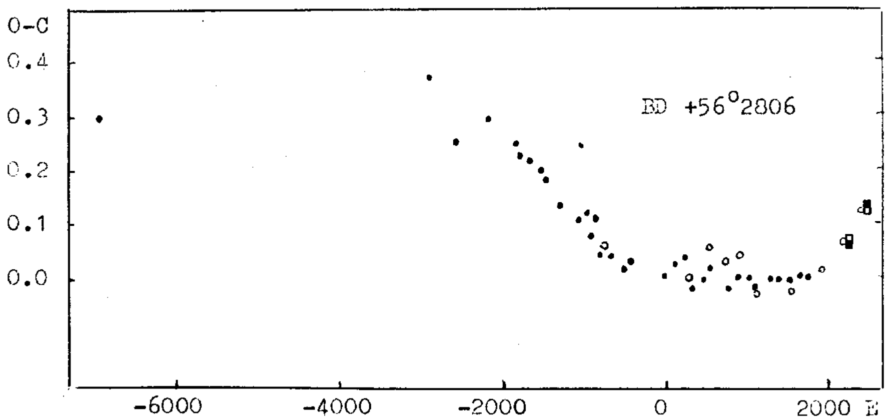


Figure 1

O-C diagram of BD +56°2806. It was constructed from the elements (2). Dots show photographic maxima, open circles - photovisual ones, filled squares - photoelectric B ones, open squares - photoelectric V ones.

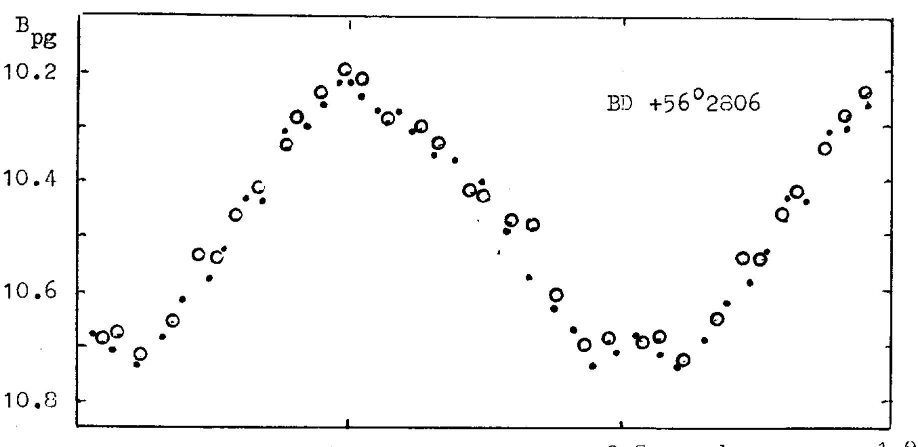


Figure 2

The mean light curve of BD +56°2806. Dots show the normal points derived from 528 observations in JD 2435310-40885 with the elements (2), open circles - ones from 318 observations in JD 2430251-34299 with elements (1).

Table 1

Times of normal light maxima

Max JD 2400000+		E	O-C (periods)	
16329.86	13pg M	-6922	+0.295	
27686.98:	5pg M	-2874	+0.370	
28508.67	14pg M	-2581	+0.250	
29675.91	18pg M	-2165	+0.295	
30615.57	16pg D	-1830	+0.223	
30624.06	9pg M	-1827	+0.249	
30983.07	28pg D	-1699	+0.213	
31302.86	12pg D	-1585	+0.197	
31675.95	15pg D	-1452	+0.179	
32029.32	2pg D	-1326	+0.133	
32789.55	19pg D	-1055	+0.105	
33143.09	14pg D(Kodak)	- 929	+0.119	
33148.59	20pg D	- 927	+0.080	
33378.73	32pg D(Kodak)	- 845	+0.110	
33524.44	98pg D	- 793	+0.046	
33555.37	27pg D(Isochrom)	- 782	+0.071	
33863.90	46pg D	- 672	+0.041	
34253.80	18pg D	- 533	+0.015	
35749.12	26pg D	0	0.000	
36088.68	58pg D,Od	+ 121	+0.031	
36461.84	52pg D,Od	+ 254	+0.038	
36475.76::	32pv Od	+ 259	0.000	
36823.59	37pg D,Od	+ 383	-0.021	
37193.96	31pg D,Od	+ 515	-0.005	
37208.18::	12pv Od	+ 520	+0.060	
37586.80	35pg D,Od	+ 655	+0.014	
37901.08::	30pv Od	+ 767	+0.034	
37914.93	45pg D,Od	+ 772	-0.029	
38277.05::	13pv Od	+ 901	+0.043	
38299.36	44pg D,Od	+ 909	-0.005	
38664.10	48pg D,Od	+1039	+0.001	
38936.15::	25pv Od	+1136	-0.031	
38981.07	55pg D,Od	+1152	-0.020	
39371.07	14pg D	+1291	-0.010	
39721.77	22pg D	+1416	-0.008	
40103.33	15pg D	+1552	-0.007	
40111.70::	22pv Od	+1555	-0.023	
40473.68	23pg D	+1684	-0.001	
40824.38	23pg D	+1809	+0.001	
41054.48::	36pv Od	+1891	+0.016	
41949.60::	39pv Od	+2210	+0.069	
42030.95	6 B	+2239	+0.065	Percy(1975)
.98	6 V	"	+0.075	"
42639.93::	18pv Od	+2456	+0.126	
42676.397	28 V	+2469	+0.125	Szabados
.425	28 B	"	+0.135	(1976)

Remarks: used plates D - Dushanbe, Od - Odessa,

M - Moscow.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1461

Konkoly Observatory
Budapest
1978 August 21

ABOUT DISCOVERY OF THE 22.4 -HR PERIODICITY IN THE VARIATIONS OF Hα RADIAL VELOCITIES OF X PERSEI, THE OPTICAL COUNTERPART OF THE X-RAY SOURCE 3U 0352+30

Radial velocity measurements of V and R components of Hα emission in the spectrum of X Persei, a peculiar BOe star have been carried out to search for a periodicity analogous to the existing 22 hr X-ray variations of 3U 0352+30.

Two kinds of periodicity have been discovered. One of them is with a period 22.4 hr (amplitude K=15-17 km/sec) analogous to 22.4 hr periodicity of the X-ray variations of the source 3U 0352+30. Another is with a 581-day one (amplitude K=35 km/sec) (see Hutchings et al. 1974, Astrophys.J, 191, L101).

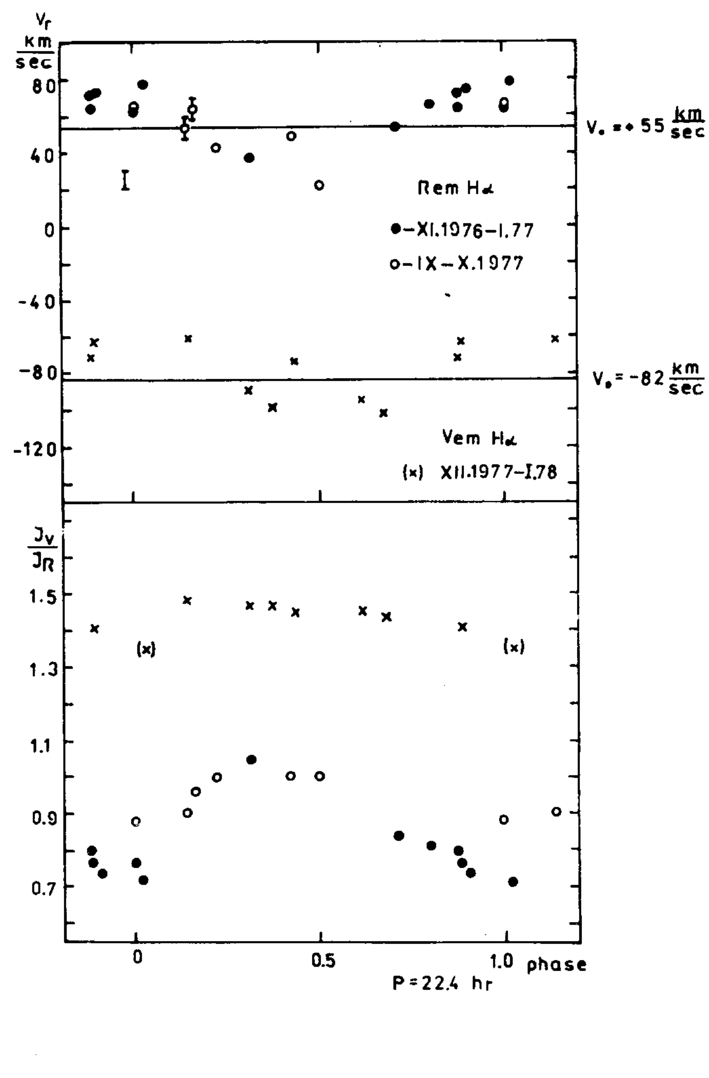
Fig.1 shows the phase dependences of Hα radial velocities (upper curve) and of V/R intensity ratio (lower curve), the 22.4 hr value has been adopted for the period.

All these led us to the evident conclusion on the association of X Persei with the X-ray source 3U 0352+30.

The X Per/3U 0352+30 system may be considered as a triple system: a neutron star moving around a BOe primary with a period of 22.4 hr, and this double system moving around a far third companion with a period 581 days.

All the details on the spectral observation of the system X Per/3U 0352+30 being carried out during the period November 1974 - March 1978 would be published in the Vol.61 of Izv.Crim. Obs.

T.S. GALKINA
Crimean Astrophysical
Observatory
p/o Nauchny, Crimea, 334413, USSR



Vr
km/sec
80
40
0
-40
-80
-120
V₀ = +55 km/sec
V₀ = -82 km/sec
Rem Hα
●-XI.1976-I.77
o-IX-X.1977
Vem Hα
(x) XII.1977-I.78
Jv/JR
1.5
1.3
1.1
0.9
0.7
(x)
(x)
0
0.5
1.0
phase
P = 22.4 hr

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1462

Konkoly Observatory
Budapest
1978 August 22

IMPROVED EPHEMERIS FOR HD128141

The G-type star HD128141 was discovered to be a binary star of W UMa type by Bond (1975), who gave the preliminary ephemeris

$$JD_{\odot} = 2442537.433 + 0^{d}.355 \cdot E.$$

We observed this star on 24 nights between April 1976 and June 1978 to obtain its light curve and improved ephemeris. The observations were made in two colours using an EMI6256S photomultiplier tube and standard B,V filters attached to the 30 cm Maksutov telescope of the University Observatory at Ankara. The comparison star was HD128128,and HD128186 and BD+9°2919 were used as occasional checks.

The observed times of minima are given below:

$MJD_{\odot}$	m.e.		E	O-C
*2442536.933			-1013.5	+0.0017
42896.8763	±0.0004	V	0	+0.0004
.8746	7	B		-0.0013
42897.9419	6	V	3	+0.0005
.9418	5	B		+0.0004
43225.0333	5	V	924	-0.0013
.0334	4	B		-0.0012
43228.9410	5	V	935	-0.0002
.9408	3	B		-0.0004
43230.0068	3	V	938	+0.0001
.0072	4	B		+0.0005
43340.8120	8	V	1250	-0.0015
.8130	16	B		-0.0005
43573.0842	8	V	1904	+0.0025
.0850	8	B		+0.0033
43666.8402	10	V	2168	-0.0011
.8399	10	B		-0.0014
43669.8616	10	V	2176.5	+0.0015
.8600	13	B		-0.0001

*Bond (1975)

The first entry was taken from Bond. The times of minima and the associated errors were calculated by the method of Kwee and van Woerden (1956).

According to the present observations, the epoch given by Bond corresponds to the minimum that is approximately $0\overset{m}{.}02$ less deep. We have therefore considered it to be the epoch of the secondary minimum.

The following ephemeris was obtained from the table:

$$MJD_{\odot}(\text{Min I}) = \underset{\pm\quad 3}{42896.8759} + \underset{\pm\quad 3}{0\overset{d}{.}3551501} \cdot E.$$

After an initial graphical solution, the O-C value for each night (V and B combined) was assigned weight according to the mean error given above. For the first entry ± 0.001 was adopted. Exclusion of the night with E=1904, with a large O-C, did not change the result significantly. The secondary minima were included in the solution with the assumption that the phase difference is exactly half the period.

Z. ASLAN
Ankara University Observatory
A.Ü. Fen Fakültesi, Ankara-Turkey

References:
Bond, H.E., 1975, P.A.S.P. 87, 877
Kwee, K.K. and van Woerden, H., 1956, Bull.Astron.Neth. 12, 327

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1463

Konkoly Observatory
Budapest
1978 August 22

NOTE ON V 1329 CYGNI = HBV 475

This emission line variable star was found by Kohouthek (1969) and its lightcurve was investigated by Stienon et al. (1974). They found a periodicity of about 960 days together with some irregular fluctuations.

We took yellow plates (103a-D+GG495) with the 31.4 cm f/16 refractor of the Wilhelm Foerster Observatory, Berlin and blue plates (Orwo ZU 2) with the 30 cm f/5 fourlens astrograph of the Observatorium Hoher List of the University of Bonn. The magnitudes of the star on these plates, listed in Table 1, were obtained by measuring the plates with an iris photometer. The magnitudes of the comparison stars, given in Table 2, are based on photoelectrical measurements kindly communicated by Dr.Kohouthek.

From our yellow observations, we found fluctuations of about $1^m.5$ in V within a few hunderd days. But also, short time lightcurve activity occur as is shown by the last four blue plates taken within a time interval of 10 days and showing an amplitude of about $0^m.5$ in B.

We acknowledge the support by the Hoher List Observatory for carrying out the observations and the use of measuring instruments and we thank Dr. Kohouthek, Hamburg for communicating his photoelectric measurements.

S. WITZIGMANN, M. KIEHL, U. HOPP
Wilhelm Foerster Sternwarte,
Berlin

References:

Kohouthek, L., 1969, I.B.V.S. No. 384
Stienon, F.M., Chartraud, M.R., Shao, C.Y., 1974, Astron.J.79,47

Table 1

Observations

Spectral Range	Date (J.D.$_{geo.}$)	Mag.	N
V	2443010^{d}.504	13^{m}.17±0^{m}.05	6
	3372.401	12.55	6
	3525.230	11.7 ±0.1	5
	3579.624	12.5	5
	3677.421	12.94±0.05	4
B	2881.637	14.0 ±0.1	5
	3374.527	12.96±0.05	7
	3713.482	14.27	6
	3718.449	14.04	6
	3719.435	13.76	7
	3723.517	14.19	5

N: Number of used comparison stars

Table 2

Adopted magnitudes of the comparison stars
(designation according to Kohouthek 1969)

Star	V	B-V	Star	V	B-V
a	10^{m}.16	+1^{m}.07	f	13^{m}.59	+0^{m}.82
b	10.34	1.07	g	13.46	1.02
c	11.06	1.22	7	12.90	0.80
d	11.61	1.39	42	13.62	0.49

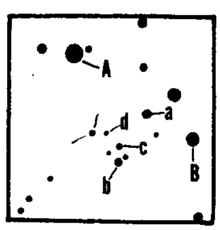
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1464

Konkoly Observatory
Budapest
1978 August 28

S4802 IN CYGNUS, AN SR STAR

Using data obtained from the Maria Mitchell Observatory, the light curve for the suspected variable S4802, (Figure 1), located in the Cygnus region, appears to have a large amount of scatter associated with the data points. This is not consistent throughout the entire curve, however, because there are definite periodic cycles apparent. These cycles, each lasting on the average about eighty days, suggest that S4802 is a semi-regular star.

Figure 1



Magnitude of Comparison Stars	Bonner Durchmusterung Catalog Number
a 12.1	A 3865
b 12.7	B 3860
c 13.2	
d 14.4	

During these cycles, the shape of the light curve is fairly symmetrical about a horizontal axis, but the amplitudes of successive peaks do not remain the same. There are three strips of the light curve which show these cycles and their varying amplitudes quite well:

Julian Date of Maximum	Maximum Magnitude
29810	12.8
29885	12.9
29960	13.0

Table (cont.)

Julian Date of Maximum	Maximum Magnitude
41190	12.9
41540	12.1
(41830	13.1)
42280	12.9
42580	13.0
42660	13.3

These smooth increases and decreases in the magnitudes of the maxima suggest that there are two periods for S4802 - creating a beat phenomenon. Perhaps the portions of the light curve in which there is much scatter, or where the cycles are indistinguishable from the mean curve, are simply the results of the interference of two periods. Intervals of little variation could likewise be caused by the cancellation of the two periods.

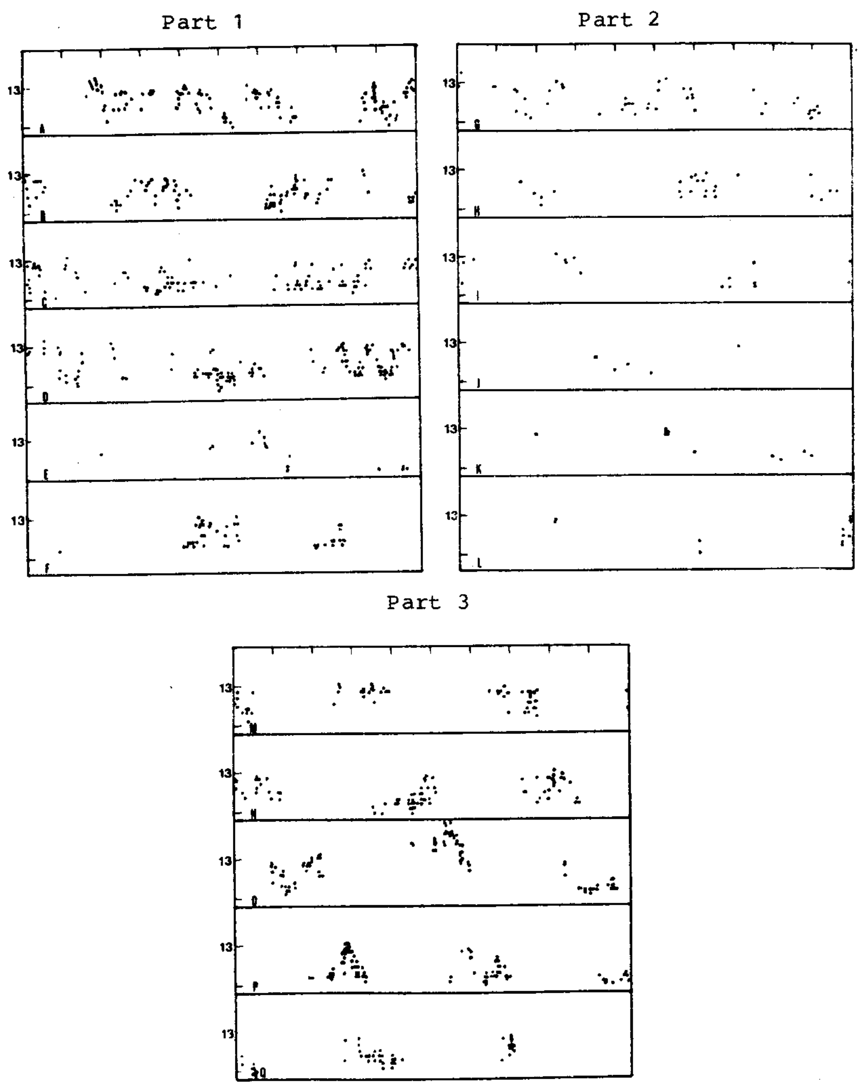
The star varies in amplitude from 12.1 at maximum to about 14.3 at minimum ($\Delta m=2^{m}.2$). Many more observations are needed to verify the possible beat phenomenon for this star.

KAREN MEECH

Maria Mitchell Observatory
Nantucket, Mass.02554,U.S.A.

The investigation of the suspected variable S4802 was carried out with the support of a scholarship from EARTHWATCH of Belmont, Massachusetts.

Figure 2



Ordinate axis - marked at one-magnitude intervals. Each strip is 1000 days, markers at 100-day intervals:

Part 1	Part 2	Part 3
A 26000-27000	G 33000-34000	M 39000-40000
B 27000-28000	H 34000-35000	N 40000-41000
C 28000-29000	I 35000-36000	O 41000-42000
D 29000-30000	J 36000-37000	P 42000-43000
E 30000-31000	K 37000-38000	Q 43000-44000
F 32000-33000	L 38000-39000	

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1465

Konkoly Observatory
Budapest
1978 August 28

S4831, A PROBABLE RV TAURI TYPE

Using the data taken from the Maria Mitchell Observatory plate collection on Nantucket Island, Massachusetts, the light curve of the suspected variable star in Cygnus, S4831, clearly exhibits characteristics of the RV Tauri class of intrinsic variables. The light curve of S4831 shows alternating shallow and deep minima, including several irregularities. Occasionally, two deep minima occur in succession, the duration of each being roughly half the period of the periodic portions of the light curve.

Irregular cycles

Julian Dates	Duration
26875-26995	120 dy
28345-28490	145 dy
29390-29550	160 dy

The star was visible on photographic plates as far back as 1916, but the best data sequences, producing nearly complete light curve, occurred within the period from July 1930 to December 1940, (JD 26000-30000). There seems to be a series of irregular variations from May 1968 to May 1971 (JD 40000-41000) in which there are intervals of as much as 200 days when the star did not vary at all. However, it is these irregularities which identify S4831 as an RV Tauri type star rather than some periodic star, say Beta Lyrae, or a long period variable as portions of its curve would indicate.

The magnitude of S4831 varies from a minimum of +15.0 to a maximum of 13.2, ($\Delta m=1.8$). The average ($\sim+14.3$) varies with each cycle, due to the varying depths of the minima, (Figure 2). Since RV Tauri stars are usually G to K spectral class supergiants, it would be desirable to have some spectra on this star.

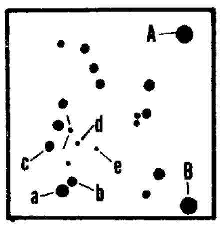
As a matter of interest, a very rough approximation of the distance would put S4831 at 25 kpc. This is the maximum distance it could be, because the effects of galactic absorption were not taken into consideration. (The average magnitude of +14.3 was used for apparent magnitude and -3.4 was used as an approximation for this type of star's absolute magnitude.)

KAREN MEECH

Maria Mitchell Observatory
Nantucket,Mass.02554,U.S.A.

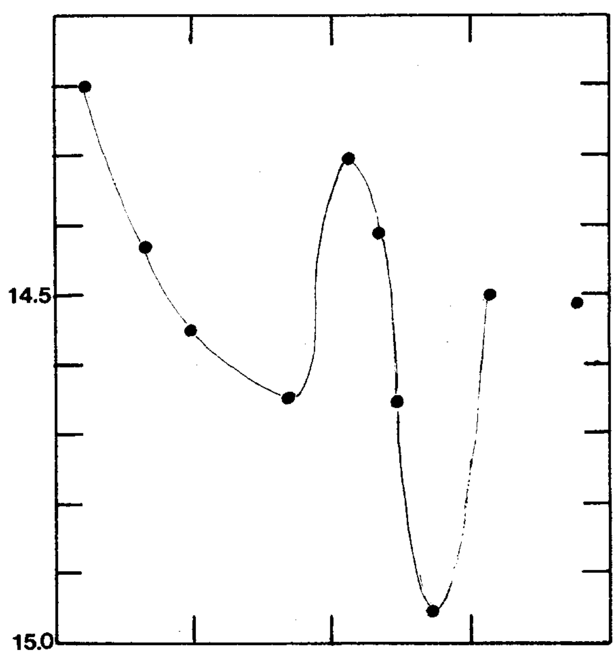
The investigation of the suspected variable S4831 was carried out with the support of a scholarship from EARTHWATCH of Belmont, Massachusetts.

Figure 1



Magnitude of Comparison Stars	Bonner Durchmusterung Catalog Number
a 11.7	A 3468
b 13.1	B 3467
c 13.6	
d 14.8	
e 15.8	

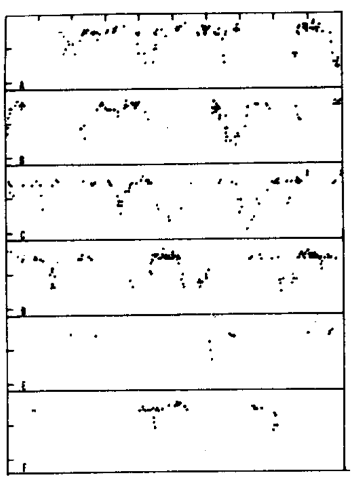
Figure 2



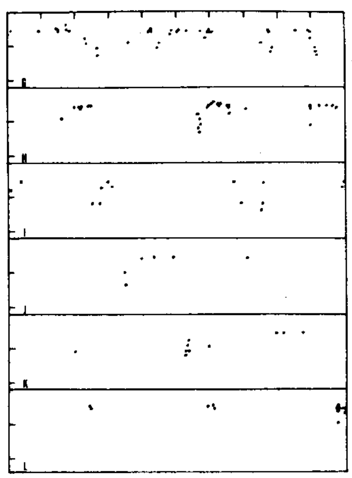
Variation of Minima
Ordinate axis - marked at tenths of magnitudes. Graph covers interval from JD 26000 to JD 30000; marked at each 1000 days.

Figure 3

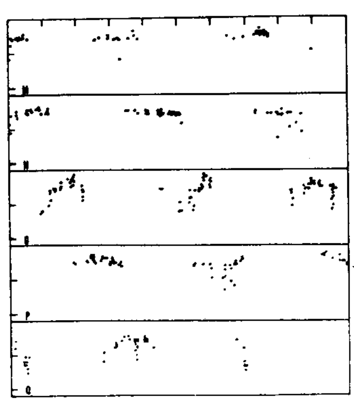
Part 1



Part 2



Part 3



Ordinate axis - magnitude markers begin at 13, with one magnitude intervals to 15th magnitude. Each strip represents 1000 days, markers placed at 100-day intervals:

Part 1	Part 2	Part 3
A 26000-27000	G 33000-34000	M 3 000-40000
B 27000-28000	H 34000-35000	N 40000-41000
C 28000-29000	I 35000-36000	O 41000-42000
D 29000-30000	J 36000-37000	P 42000-43000
E 30000-31000	K 37000-38000	Q 43000-44000
F 32000-33000	L 38000-39000	

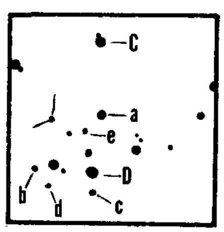
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1466

Konkoly Observatory
Budapest
1978 August 28

VERIFICATION OF S4846 IN CYGNUS

The suspected variable star in Cygnus S4846, (Figure 1), appears to be an interesting long period irregular variable with possible semi-regular tendencies. Photographic data are available (for S4846) at the Maria Mitchell Observatory from July 1930 to the present. The observed maxima do not occur in regular intervals, but they do seem to occur in groups, with fairly long intervals of relatively little variation. These groups, however, are separated by similar durations in between them.

Figure 1



Magnitude of Comparison Stars	Bonner Durchmusterung Catalog Number
a 12.1	C 2980
b 12.7	D 2981
c 13.1	
d 13.3	
e 14.1	

Group	Julian Date	Duration
1 - 2	27400-34160	6760 d (18.5 yr)
2 - 3	34160-39770	5610 d (15.36 yr)

(As measured from beginning of ascent of the series of maxima.) Seasonal gaps create voids in the data where possible maxima could occur, but this is unlikely because of the duration of the observed maxima and the extremely long minimum detected from JD 26162 to JD 26694 (532 days). Most maxima are fairly symmetrical with slow ascent and descent. The duration of most good maxima varies slightly, but the average is about 430 days, (ranging from 300 days to nearly 500 days.).

Just as the durations of maxima vary, so do the changes in magnitude from maxima to minima. The maximum observed magnitude is about 12.2, and the star usually stays around a minimum of 14.1 (Δm=1.9).

Spectral analysis would be useful in trying to classify this star.

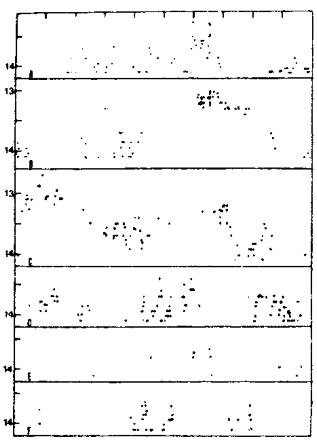
KAREN MEECH

Maria Mitchell Observatory
Nantucket, Mass.02554,U.S.A.

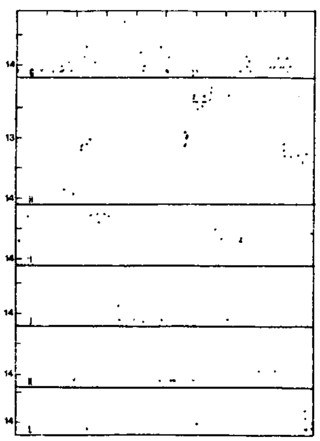
The investigation of the suspected variable S4846 was carried out with the support of a scholarship from EARTHWATCH of Belmont, Massachusetts.

Figure 2

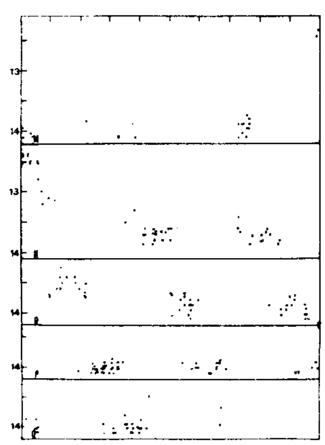
Part 1



Part 2



Part 3



Ordinate axis - marked at half-magnitude intervals. Each strip is 1000 days; markers at 100-day intervals:

Part 1	Part 2	Part 3
A 26000-27000	G 33000-34000	M 39000-40000
B 27000-28000	H 34000-35000	N 40000-41000
C 28000-29000	I 35000-36000	O 41000-42000
D 29000-30000	J 36000-37000	P 42000-43000
E 30000-31000	K 37000-38000	Q 43000-44000
F 32000-33000	L 38000-39000	

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1467

Konkoly Observatory
Budapest
1978 August 31

SUPPLEMENTARY PROGRAMME OF COOPERATIVE FLARE STAR OBSERVATIONS FOR 1978

The Working Group on Flare Stars after consultation with the Nuffield Radio Astronomy Laboratories, University of Manchester announces the following Supplementary programme of cooperative optical and radio observations inclusive:

EV Lac from $14^{h}00^{m}$ UT on Tuesday 5 September as far as possible continuously until $08^{h}00^{m}$ UT Saturday 9 September.

L.N. MAVRIDIS
Chairman Working Group on
Flare Stars

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1468

Konkoly Observatory
Budapest
1978 September 1

TIMES OF MINIMA OF UX UMa

	Time of Primary Minimum	O-C (days)
Hel.J.D.	2443656.6784	-0.0024
	2443657.6619	-0.0023
	2443658.6454	-0.0021

The shape of the light curve appears normal, but the observed times of minimum are badly discordant (by about $0\overset{d}{.}002$) with an assumed periodic, smooth O-C deviation from linear elements as reviewed by Kukarkin (1977 MNRAS 180. 5P).

R. J. PANEK

J. ZINK

Department of Astronomy
The Pennsylvania State University
University Park, PA 16802

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1469

Konkoly Observatory
Budapest
1978 September 7

CD $-30^{\circ}5135$

New photographic magnitude determinations have revealed brightness variations of hitherto unknown amplitude in this interesting emission-line F supergiant. The plates were taken by Dr. S. Wramdemark with the Schmidt telescope of the Uppsala Southern Station at Mount Stromlo Observatory, Australia, and the photometric calibration was made by the same means as in my previous report on the star, IBVS No. 1313, 1977. The following magnitudes were obtained (estimated error ± 0.1 mag.):

	V	B	U
Jan. 11, 1978	8.75	9.9	10.7
Jan. 14, 1978	9.1	10.1	10.6

When this is compared to the photometry by Humphreys (PASP 87, 933, 1975), it is seen that the amplitude of the light variations is almost one magnitude in V, and that the star seems to become redder as it brightens.

It has been pointed out earlier (Welin, IBVS No. 1139, 1976) that the star is not a spectroscopic binary, as was suggested by Humphreys (op. cit.). There still remains, however, to relate the brightness variations to variations in the emission and other spectral features, as well as in radial velocity. Simultaneous monitoring of the star by spectroscopic and photometric means for some time seems highly desirable.

GUNNAR WELIN
Astronomiska Observatoriet
Box 515
S-751 20 Uppsala, Sweden

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1470

Konkoly Observatory
Budapest
1978 September 8

NEW FLARE STARS IN THE NGC 7000-REGION

In the period from July 1975 to November 1977 we continued the systematic search for flare stars in the NGC 7000-IC 5068-70 region.

Our patrol observations were made with the 40"/52" Schmidt-telescope at Byurakan Astrophysical Observatory on Kodak 103aO- or ORWO ZU-2 plates with 2 mm Schott UG 1- or without filter.

Table I gives the data for the plates, number of exposures and effective time of observations in U- and Pg-light.

Table I

Colour	Number of plates	Number of exposures	T_{eff}
U	47	284	44^h10^m
Pg	40	239	20^h50^m

In the most cases the time of an exposition was 10 min in U- and 5 min in Pg-light. Total time of all multiple exposure observations is 65 hours.

In Table II tha data are presented for five new flare stars discovered.

Table II

Designation	RA	D	m_{pg}	$m_{u/pg}$	Date of flare-up
B 41	$20^h44^m.1$	$+43°38'$	$17^m.1$	$2^m.6$u	13.07.1975
B 42	49.5	40 43	20.0	4.1pg	22.08.1976
B 43	51.7	41 33	20.5	7.0u	11.09.1977
B 44	55.5	42 58	20.5	5.7u	5.11.1977
B 45	58.6	43 04	15.5	2.1u	29.08.1975

Column 1: the serial number of the flare stars discovered at the Byurakan Astrophysical Observatory.
Column 2 and 3: the approximate coordinates for 1950.0
Column 4: the approximate photographic magnitudes at minimum light on POSS-reproductions.
Column 5: the observed amplitude of the flare-up in U- or Pg-light.
Column 6: the date of the flare-up.

N.D. MELIKIAN
H.S. CHAVUSHIAN
Byurakan Astrophysical Observatory

M.K. TSVETKOV
Department of Astronomy
Bulgarian Academy of Sciences

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1471

Konkoly Observatory
Budapest
1978 September 12

NS Mon

I observed the light variations on 425 plates (Sky-patrol Sonneberg Observatory and Bruno-H.-Bürgel-Observatory Hartha). 13 new minima and the following elements were obtained:

Min.(hel.)= J.D. 2441599.600 + $0^d.9399163 \cdot E$ (EW)

max.= $10^m.6$ ph min.= $11^m.1$ ph/$11^m.1$ ph

Min.(hel.) J.D.24...	E	O-C
38 673.614	-3113	-0.026
39 057.613	-2704.5	+0.017
146.426	-2610	+0.008
441.534	-2296	-0.018
40 152.585	-1539.5	-0.013
504.560	-1165	-0.037
41 329.375	- 287.5	+0.001
330.330	- 286.5	+0.016
385.334	- 228	+0.033
599.585	± 0	-0.015
680.468	+ 86	+0.035
983.569	+ 408.5	+0.013
42 448.326	+ 903	-0.018

Further particulars will be published in "Mitteilungen der Bruno-H.-Bürgel-Sternwarte Hartha" Heft 14.

K. HÄUSSLER
Bruno-H.-Bürgel-Sternwarte
DDR-7302 Hartha

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1472

Konkoly Observatory
Budapest
1978 September 13

A SEARCH FOR VARIABILITY OF SOME SELECTED STARS

During several observing periods at the ESO site in La Silla (Chile), the He-weak-stars α Scl and 12 CMa, the old nova RR Pic and the T Tauri-star V 380 Ori have been tested for variability, especially for short periodic oscillations. The reduction techniques were the same as described by Haefner et al. (1975).

He-weak-stars are suspected to show photometric and spectroscopic variations (Jaschek et al. 1974). One of the brightest members of this group, α Scl, has been observed with a photometer in a high speed mode and a spectrum scanner (Schoembs et al. 1976). For 12 CMa only two photometric runs have been obtained. The observational data are compiled in Table 1.

Table 1 The observations (He-weak-stars)

Photometry (Hβ wide/narrow)*

Star	Telescope	Date	Start (UT)	Dur. (min.)	Integrat. time (s)	Time resolution (s)
α Scl	60cm Bochum	1974, Nov. 25	01^h08^m	40	1	4
		1974, Dec. 05	01 20	22	1	4
		06	00 49	36	1	4
		12	01 01	145	1	4
		13	01 05	33	1	4
		14	01 02	93	1	4
	50cm ESO	1975, Nov. 03	00 39	103	2	8
12 CMa	60cm Bochum	1974, Dec. 06	04 49	38	1	4
	50cm ESO	1975, Nov. 02	06 05	125	2	8

Scanner (Hα, Hβ)

Star	Telescope	Date	Start (UT)	Dur. (min.)	Spectral resolution (A)	Time resolution (s)
α Scl	50cm ESO	1974, Nov. 25	00^h47^m	90	7	17
		1974, Dec. 05	00 46	60		
		06	00 30	60		
		12	00 36	60		
		13	00 46	60		
		14	00 35	120		

*) Cyclically used

The longer runs have been analyzed by Fourier techniques, but no period in the range between 17 and 500 s could be detected. Night to night changes also were not evident. The r.m.s.-variation of the ratio H_β wide/H_β narrow amounts to 0.33 % for α Scl and to 0.18 % for 12 CMa. For the mean values of the scanner equivalent widths of H_α and H_β (α Scl) we obtained 5475±106 mA and 5403±38 mA, respectively. In accordance with the photometry the equivalent widths do not show any systematic variation during the observation period.

To look for the 30 s - period reported for RR Pic (Warner, 1976), high speed photometric observations have been performed. Additionally (partly simultaneous) polarimetric observations were obtained. The observational data are listed in Table 2.

Table 2 The observations of RR Pic

Photometry (Integral)

Telescope	Date	Start(UT)	Dur.	Integrat. time (s)	Time resolution (s)
50cm ESO	1973,Oct. 29	06^h27^m	2^h49^m	0.99	1
	30	04 21	4 00	0.99	1
	1977,March 11	01 35	1 30	1	3
	12	03 03	1 20	1	3
	13	03 12	1 20	1	3
	14	00 43	3 45	1	3

Polarimetry (Integral)

Telescope	Date	Start(UT)	Dur.	I-Time/ single measurement (s)	Number of measurements
1m	1973,Oct.29	06^h53^m	1^h20^m	480	3
	30	04 52	2 34	480	6

All photometric runs have been investigated for short periodic oscillations in the range from 6 to 500 s. But no significant period could be found. Polarization degree and angle show a large scatter which is enhanced at the rising part of the light curve. The mean values are $\overline{P}=(23 \pm 31)\cdot 10^{-4}$, $\overline{\theta}=15^\circ \pm 34^\circ$. The scatter, which is twice that for the comparison star, probably indicates a variability which should be confirmed by further observations.

V380 Ori has been observed photometrically. The data are compiled in Table 3.

Table 3 The observations of V380 Ori

Telescope	Date	Start(UT)	Dur.	Integrat. time (s)	Time resolution (s)
60cm Bochum	1974,Dec.06	02^h10^m	1^h40^m	1	2
50cm ESO	1974,Dec.06	02 10	1 10	1	0.99

The analysis of these simultaneous runs did not reveal a significant periodicity in the range between 6 and 500 s.

R. HAEFNER
K. METZ
R. SCHOEMBS
Universitäts-Sternwarte
Scheinerstr. 1
D-8000 München 80
Germany

References:

Haefner, R., Metz, K., Schoembs, R. 1975,Astr.& Astrophys.38,203
Jaschek, M., Jaschek, C. 1974, Vistas in Astronomy 16, p. 131
Schoembs, R., Spannagl, C. 1976, Astr. & Astrophys.Suppl.26, 55
Warner, B. 1976, IAU Symp. No. 73, p.85

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1473

Konkoly Observatory
Budapest
1978 September 18

R Pup - A VARIABLE AFTER ALL

The G0Ia supergiant R Pup (HD 62058) was first reported by Gould (1879) to be variable. During the following century however its variability could not be confirmed by any of the numerous subsequent observers. R Pup thus was considered constant since 1907 although recently White (1975) finds some possible evidence for very slow variations in both brightness and colours.

R Pup was observed in UBV on 7 nights between January 3 and January 30, 1977. The comparison stars used were HD 61409 a K0 star and HD 60646 a F0 star. Their respective magnitudes remained constant within $0^m.002$ during this period. R Pup revealed definite variations in magnitude and colours on a time scale well exceeding the 27 days covered by the observations, the V magnitude dropping by about $0^m.002$ a day towards a minimum. The overall amplitude observed was $0^m.19$ in U, $0^m.12$ in B and $0^m.06$ in V but is certainly larger.

The behaviour of R Pup is strikingly similar to that of HD 101947 for which G0Ia star Reipurth and Eichendorf (1978) presume that it may be a very long-period low-amplitude classical cepheid. Observations of that star and of other hitherto unsuspected supergiants will be submitted shortly to Astronomy and Astrophysics.

M.J. STIFT

Institut für Astronomie
der Universität Wien
Türkenschanzstr. 17
A-1180 Wien, Austria

References:

Gould, B.A.: 1879, Res.Obs.Nac. Argentino Cordoba, 1
Reipurth, B.,Eichendorf, W.: 1978,I.B.V.S. No. 1450
White, S.D.M.: 1975, Astrophys.J. 197, 67

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1474

Konkoly Observatory
Budapest
1978 September 18

VZ CEPHEI IS AN ECLIPSING BINARY

The variable star VZ Cephei is classified in the GCVS 3 as "Is?". M. Beyer (1) observed it visually in the period from 1929 to 1937 and noticed irregular minima like BO Cephei. Also G. Romano (2) found the light variation to be irregular. The object was therefore taken into our photoelectric observation program for young stars and frequently observed in UBV during the period from 1975 April 28 to 1978 August 2 with the Sonneberg 60 cm telescope II. The absence of emission features in the spectrum (obtained with the Tautenburg 2 m telescope by P. Notni) gave a first indication that the object was probably not a young star in the pre-main-sequence stage. Photoelectric observation clearly showed that it is an eclipsing binary. The comparison star was BD+70°1200, which was compared with the star BD+70°1195 as a check. Star BD+70°1200 was linked to star No.8 in NGC 7160 (3) with the UBV values $V = 10\overset{m}{.}50$, $B-V = +0\overset{m}{.}44$, $U-B = +0\overset{m}{.}02$. The following elements for the light variation and photometric data could be determined.

<u>VZ Cephei</u> $M_O = 244\ 3720.420$

$P = 1\overset{d}{.}18336$

$V_{max} = 9\overset{m}{.}74$, $(B-V)_{max} = +0\overset{m}{.}48$, $(U-B)_{max} = +0\overset{m}{.}06$

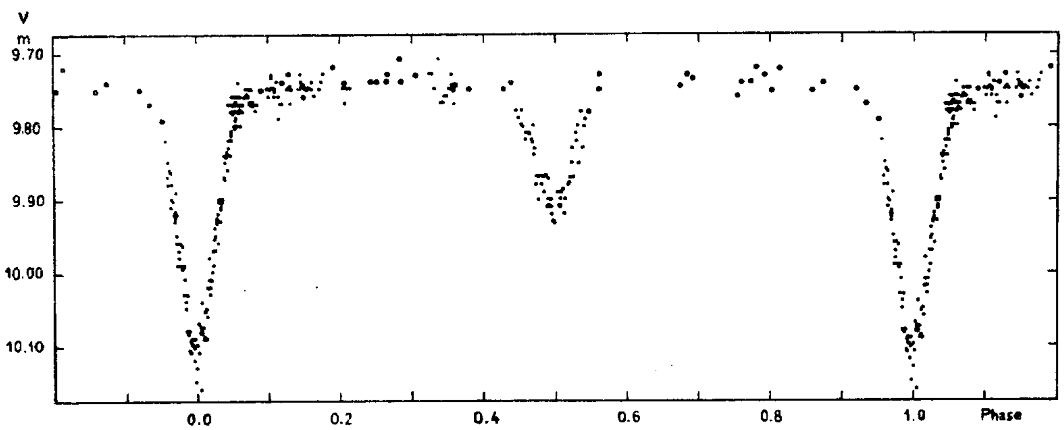
<u>BD+70°1200</u> $V = 9\overset{m}{.}82$, $B-V = +0\overset{m}{.}53$, $U-B = +0\overset{m}{.}03$

S. RÖSSIGER

Zentralinstitut für Astrophysik
Sternwarte Sonneberg
DDR-64 Sonneberg

References:

Beyer, M., 1950, Astron.Abh. (Erg.Astron.Nachr.) 12, Nr.2
Romano, G., 1962, Oss.astr.Padova Pubbl. N. 125
Hoag, A.A., et al., 1961, Publ. U.S. nav. Obs., 2nd ser., Vol. 17, part 7



Mean light curve of VZ Cephei
dots: single measurements,
larger dots: mean of three single measurements

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1475

Konkoly Observatory
Budapest
1978 September 25

CONCERNING VARIABLE STAR 7 IN M13

Variable star 7 in the globular cluster M13 = NGC 6205 was suggested not to be a physical member of the cluster by Kadla (1966, Iz. Pulkova Observ. 24, 93) based on her proper motion study of M13. Non-membership seemed to be supported by the rather short period of 0.2388^d found for the star by Arp (1955, Astron.J. 60, 317). However, Ibanez and Osborn (1973, IBVS 769) found that the associated period of 0.312393^d apparently satisfied the available observational data somewhat better.

New B and V photographic observations have been obtained at the Michigan State University Observatory and the U.S. Naval Observatory, Flagstaff Station. These new observations confirm that the longer period is superior. Combining all the observational material for Variable 7, a best value for the period of 0.3126626^d was found. There was no evidence for a period change during the time covered by the observations.

Furthermore, the new observations allow the B and V characteristics of the variable to be determined. The results are:

	B	V	B-V
Mean magnitude	15.14	14.86	0.28
Total amplitude	0.31	0.26	0.05

These values make the star somewhat redder and fainter than found by Demers (1971, Astron.J. 76, 445) and place it just redward of the red edge of the horizontal branch in Sandage's (1970, Astrophys.J. 162, 841) HR diagram for M13. This strongly suggests cluster membership. In addition, Cudworth 1978,(152nd meeting of the AAS in Madison, USA) has recently reported that a new astrometric study yielded a proper motion for the variable consistent with cluster membership. These results make it virtually certain that

Variable 7 is indeed a physical member of M13.

The observational data and a complete discussion of this work will be published elsewhere along with our results for the other RR Lyrae stars of the cluster.

WALTER BISARD and WAYNE OSBORN

Physics Department
Central Michigan University
Mt. Pleasant, Michigan 48858,
U.S.A.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1476

Konkoly Observatory
Budapest
1978 September 26

THE BELATED DISCOVERY OF NOVA Cen 1973 AND
POSSIBLE NOVAE Car 1971 AND 1972

One certain and two possible novae have been found on objective-prism plates taken with the Curtis Schmidt telescope at Cerro Tololo, Chile. The plate-filter combination is IIa-F+RG 1 at a dispersion of 420 Å/mm at Hα; the limiting red magnitude is about 12 for the continuum of a blue star.

Nova Cen 1973- position: $13^h10^m47^s.9$, $-57^o24'50''$ (1950). The two plates of this field were taken on April 23 and 25, 1973. The spectra show little difference and are dominated by broad Hα emission; the total width corresponds to a velocity range of about 1800 km/s. Other emission lines, faint and broad, are: 6678 of He I (trace), 6456 (int.2), 6369 (int. 2) 6318 (int. 3), 6247 and 6148 (both int. 1), all of permitted Fe II multiplets 40 and 74, except for 6318 which is unclassified. The [O I] lines, 6300 and 6364, may be present but are blended with the iron lines. The continuum corresponds to V about 11. It was probably a slow nova taken while in the diffuse enhanced stage. Figure 1 is a chart of the region 10 arcmin on a side drawn by hand from a low-dispersion infrared plate. There are two infrared plates available, taken March 5, 1970 and April 6, 1972, reaching approximate infrared limiting magnitude 12.5 which show no image at the nova position. We have one other red prism plate of the region taken on June 2, 1968 which shows nothing at the position. W. Liller, Center for Astrophysics, informs us that Ms.L. Chaisson has searched Patrol plates taken in 1970 and in April 1978 and finds nothing at this position down to 15th magnitude. N. Sanduleak, Warner and Swasey Observatory, has examined the plate collection at that observatory and also reports nothing at this position.

Possible Nova Car 1971- position: $10^h37^m59^s$, $-62^o58'33''$ (1950). This object shows only strong Hα emission on a plate taken Feb.18, 1971 but shows nothing in a deeper prism plate taken thirteen months later.

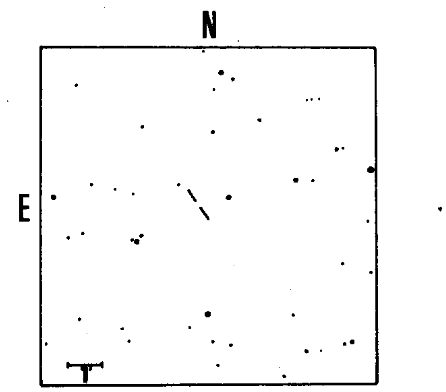


Figure 1. Identification chart for Nova Cen 1973 drawn by hand from a low-dispersion infrared plate. The bright star at the western edge is CoD-56° 4842.

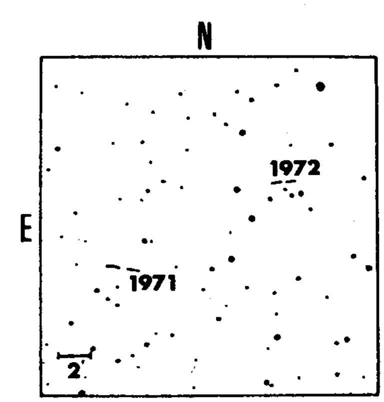


Figure 2. Identification chart for possible Novae Car 1971 and 1972 with characteristics of Fig. 1 except for the scale. The bright star in the NW corner is CoD-62°470.

The total width of Hα corresponds to a velocity range of about 1200 km/s. Its position is shown in Fig.2 which has the same characteristics as Fig. 1 except for the scale.

Possible Nova Car 1972- position: $10^h36^m35^s$, $-62^o52'52''$ (1950). Figure 2 also shows the position of this object some 11 arcmin from the possible Nova Car 1971. It also shows only strong Hα emission on a plate taken on March 22,1972 but nothing on the Feb. 1971 plate mentioned above. The width of Hα can be interpreted as a velocity range of about 1200 km/s. The deep, low-dispersion infrared plate from which Fig. 2 was made shows nothing at the position of either Carina object.

D. JACK MacCONNELL
ELIAS PRATO C.
CÉSAR BRICEÑO A.
CIDA
Apartado 264
Mérida, Venezuela

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1477

Konkoly Observatory
Budapest
1978 September 26

PHOTOMETRIC BEHAVIOUR OF OMICRON ANDROMEDAE

The star Omicron And has variously been attributed different kinds of light variation. Schmidt (1959) found the star to be an eclipsing binary with a period of $1^d.5998398$, whereas, spectrographic observations by Galeotti and Pasinetti (1968) did not support its eclipsing nature. Olsen (1972) suggests the star to have Beta-Lyrae type variations with a period of $1^d.0185$, or alternatively that the light variations may be due to the intrinsic variations of a single shell star. Bossi et al. (1976) correlate the brightness variation, of the order of $0^m.1$, with a shell which the star ejected in July 1975. They give no definite period. Recent work by Fracassini and Pasinetti (1977) indicates that period of shell phenomena may be about 23.5 years. Dworak (1976) has recorded a minimum of the star.

The star was observed by us photoelectrically on the 38-cm reflector of the Uttar Pradesh State Observatory on a total of 18 nights during the period October 1976 - December 1977, using a refrigerated (-20°C) photomultiplier tube, the conventional U, B and V filters of the Johnson and Morgan system, and standard d.c. techniques. 2 And was used as a comparison star. The average standard deviations of the comparison star on 9 random nights are $0^m.011$, $0^m.011$ and $0^m.010$ in U, B and V filters, respectively.

Our observations were planned on the basis of the following two ephemeris:

(a) Primary minimum = JD 2436174.430 + $1^d.5998398$, Schmidt (1959);
(b) Primary minimum = JD 2439470.628 + $1^d.0185$, Olsen (1972).

The U, B, V light curves given in Figures 1 and 2, cover almost the entire phases respectively on the above two suspected periods with the $\pm 2\sigma$ error bars marked on them. The light curves do not show eclipses or any kind of intrinsic variation with periods of $1^d.5998398$ or $1^d.0185$. The light curves on individual

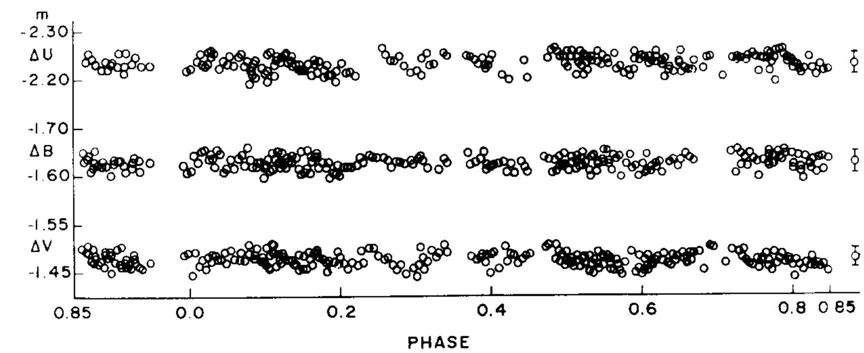


Figure 1. Light curves of o And on an assumed period of $1^{d}.5998398$. The differential magnitudes are in the sense variable <u>minus</u> comparison.

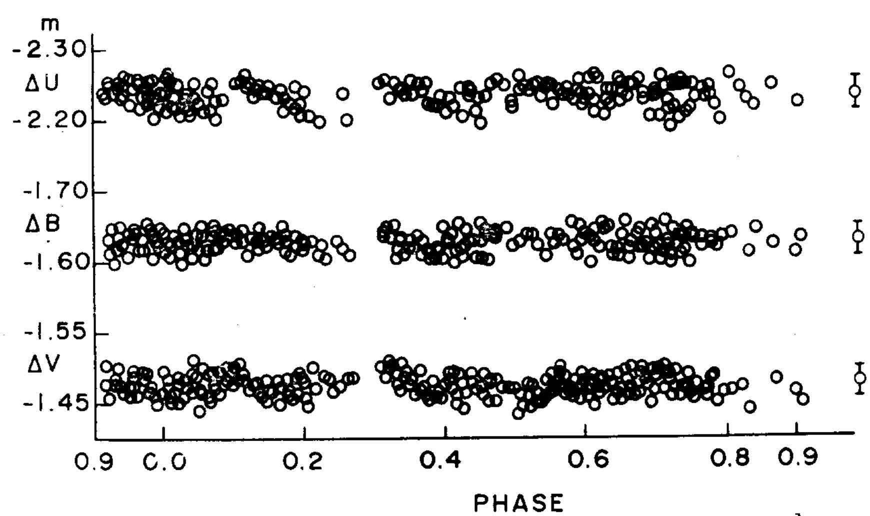


Figure 2. Light curves of o And on an assumed period of $1^{d}.0185$. The differential magnitudes are in the sense variable <u>minus</u> comparison.

nights, especially those when primary or secondary minima were predicted on the basis of either of the ephemerides, were also carefully examined, but failed to provide any evidence of light variation exceeding $\pm 2\sigma$. Thus, while it appears certain that the star is not a binary, the star did not show any kind of activity during the period covered by our observations.

The author is thankful to Dr.S.D. Sinvhal for helpful discussions and suggestions.

T.D. PADALIA
Uttar Pradesh State
Observatory
Manora Peak,
Naini Tal-263129,
India

References:

Bossi, M., Guerrero, G., Mantegazza, L., 1976, I.B.V.S.No.1095
Dworak, T.Z., 1976, I.B.V.S. No.1081
Fracassini, M., Pasinetti, L.E., 1977, I.B.V.S. Nos.1341,1363
Galeotti, P., Pasinetti, L.E., 1968, I.B.V.S. No.301
Olsen, E.H., 1972, Astron.Astrophys., 20, 167
Schmidt, H., 1959, Zeitschrift für Astrophysik, 48, 249

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1478

Konkoly Observatory
Budapest
1978 September 27

PHOTOELECTRIC MINIMA OF SEVEN ECLIPSING BINARIES AND A SINGLE MAXIMUM OF BW VULPECULAE

We report herein photoelectric observations of seven eclipsing binaries and BW Vulpeculae made in 1975 and 1976 with the 40-cm Boller and Chivens f/18 Cassegrain telescope of the University of Montana. This telescope, located on 1980-meter Blue Mountain about six air miles southwest of the university campus, is equipped with an Astro Mechanics single-channel photometer containing an unrefrigerated EMI 6256B PM tube. The observations were made through a Corning 3384 V-band filter. The photomultiplier signal is fed through a DC amplifier to a voltage-to-frequency converter, whose output is integrated for ten seconds by an electronic counter. Three such integrations constitute a single observation. The observations were reduced by computer to produce extinction-corrected differential visual magnitudes (program star-comparison star) as a function of heliocentric Julian Date using the photometry reduction program of Walter Fitch (Steward Observatory). The heliocentric times of the observed minima were determined graphically by the chord bisection method. Table 1 lists the observed times of minimum and their probable errors, the epoch numbers E, and the O-C values. Table 2 gives the ephemerides used to calculate the O-C values.

Table 1. Observed Heliocentric Times of Minimum

Star	Hel. JD - 2,440,000	E	O-C
KO Aql	2637.8558 ± 0.0005	262	+0^{d}.0085
44 i Boo	2619.8345 ± 0.0015	10,333	+0.0025
RZ Cas	2633.7591 ± 0.0002	10,674	-0.0008
	2664.8340 ± 0.0001	10,700	-0.0023
	2670.8114 ± 0.0003	10,705	-0.0012
	3049.7003 ± 0.0008	11,022	-0.0056
TW Cas	2666.8395 ± 0.0014	461	-0.0047
	3096.7636 ± 0.0003	762	-0.0073
	3103.9140 ± 0.0004	767	+0.0014
DO Cas	2636.7778 ± 0.0003	12,722	+0.0003
	2664.8447 ± 0.0003	12,763	-0.0041
XX Cep	2663.7476 ± 0.0003	1866	+0.0062
AT Peg	2661.8070 ± 0.0006	1940	-0.0197

Table 2. Ephemerides for Eclipsing Binaries

Star	Heliocentric JD	Period (days)	Source
KO Aql	2,441,887.4714	2.86403	SAC 49
44 i Boo	2,439,852.4903	0.2678159	Dürbeck
RZ Cas	2,429,875.6902	1.1952473	Herczeg and Frieboes-Conde
TW Cas	2,442,008.3850	1.428328	SAC 49
DO Cas	2,433,926.4573	0.68466595	SAC 49
XX Cep	2,438,302.3209	2.33731	SAC 49
AT Peg	2,440,438.383	1.146105	SAC 49

Minima of AT Peg observed in 1974 and 1976 by Pohl and Kizilirmak (1974; 1976) also give negative O-C's, based on the ephemeris used here, of -0.0041 and -0.0118, respectively, suggesting a possible decrease in the period of AT Peg of the order of $0\overset{d}{.}00001$ since 1969.

The observed maximum of BW Vul was found to occur at

$$\text{Hel. JD (Max)} = 2,443,060.6544 \pm 0.0005.$$

The parabolic ephemeris equation derived by Valtier (1976) applied to the above time yields O-C = +0.0156 days, while the linear ephemeris equation of Tunca (1978) yields O-C = -0.0014 days.

T.E. MARGRAVE, J.H. DOOLITTLE,
D. CUTILLO, and J.S. SCHERRER

Blue Mountain Observatory
University of Montana
Missoula, Montana 59812
USA

References:

Dürbeck, H. W.: IBVS No. 1023, 1975.

Herczeg, T. and Frieboes-Conde, H.: Astr. and Ap., 30, 259, 1974.

Kordylewski, K.: Supplemento ad Annuario Cracoviense No. 49, Krakow 1977.

Pohl, E. and Kizilirmak, A.: IBVS No. 937, 1974; IBVS No. 1163, 1976.

Tunca, Z.: IBVS No. 1386, 1978.

Valtier, J.-C: Astr. and Ap., 51, 465, 1976.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1479

Konkoly Observatory
Budapest
1978 September 28

TWENTY LONG-PERIOD VARIABLES

The twenty Mira or SR type variable stars listed in Table I have been examined on Nantucket plates to ascertain if any of them have changing periods. The arrangement in the table is by right ascension. The periods given in the General Catalogue of Variable Stars for the named variables in Sagittarius had been obtained from Harvard plates spanning the interval 1924-1953. The new period-determinations have incorporated these earlier observations. None of the periods has changed significantly in the interval indicated in the penultimate column; the new periods are simply improvements over the previous values and they satisfy the old observations as well as the new.

The initials in the final column indicate who determined the new periods: SB, Sara Beck; DC, Deborah Crocker; DH, Dorrit Hoffleit; SS, Stephen Sands; and WW, Wendy Whiting.

This work was accomplished under a welcome grant from the U.S. National Science Foundation, NO.AST78-07405.

DORRIT HOFFLEIT
Maria Mitchell Observatory
Nantucket, Mass. 02554,
U.S.A.

Table I.

Long Period Tested for Changes

Variable	JD_o	Periods GCVS	Periods New	Time Span	Comp.
V1671 Sgr	39030	191	190.5	1924 - 1978	DC
V1672	43750	235	236	" "	DH
V1674	43310	195	Same	" "	DC
New A*	43330	-	283	1957 - 1978	SB
V1676 Sgr	41140	256	257	1924 - 1978	SB
V1677	41950	238	239	" "	DH
V1678	42650	213	212	" "	SB
V1679	42330	242	Same	" "	DC
V1681	41100	223	222	" "	SB
V1682	42310	192.25	Same	" "	SB
V1685	43350	266	Same	" "	DH
V1687	43375	186	186.3	" "	DH
V1688	42250	320	321	" "	SB
V1690	42580	291	Same	" "	DH
New B*	42275	-	232	1957 - 1978	SB
AA Sct	43700	153	263	1926 - 1978	WW
AP Sct	42960	104.6	Same	" "	WW
V540 Cyg	43250	-	361	1930 - 1978	SS
FP Lyr	43370	270:	278	" "	DC
CSV4713	43380	-	187.5	" "	SS

*A, Discovered by Sara Beck at $18^h25^m26^s$ - $26^\circ42'.8$,13.0- [15.2pg
B, " " " " " 18 30 31 - 25 29.5,14.6- [16.1

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1480

Konkoly Observatory
Budapest
1978 September 29

W UMa PHOTOELECTRIC MINIMA: A NEW PERIOD INCREASE

Some new W Uma minima have been photoelectrically observed with the 400 mm ϕ, f=200 mm newtonian reflector of our observatory (1P21 photomultiplier unrefrigerated).

The list below contains heliocentric times of minima of this eclipsing binary, calculated by means of the Kwee and Van Woerden method. Observations have been carried out in 1977 and 1978 with a standard Johnson UBV filters system. Column "$(O-C)_1$" has been determined with the elements given in the "Rocznik Astronomiczny Obserwatorium Krakowskiego 1974", while "$(O-C)_2$" is referred to the elements:

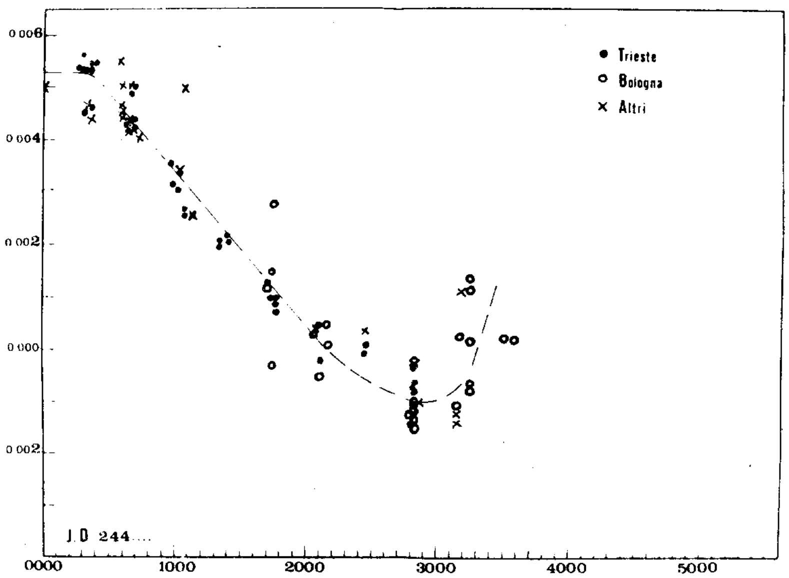
$$\text{Min} = 2435918.4154_{1} + 0.33363808_{3} \cdot E \text{ (Cester 1973)} \qquad (1)$$
m.e

Column N denotes the number of observations, while "m.e" the mean error obtained by the above mentioned method.

filter	J.D.(hel.) 2443.....	m.e	$(O-C)_1$	$(O-C)_2$	N
V	161.3634	±0.0001	-0.0083	-0.0011	65
V	163.3712	.0003	.0070	+0.0003	47
V	248.4454	.0003	.0060	+0.0014	54
V	250.4452	.0003	.0080	-0.0007	46
B	250.4448	.0004	.0083	-0.0010	46
U	251.4474	.0002	.0062	+0.0011	40
U	254.4497	.0003	.0072	+0.0002	30
V	515.3547	.0002	.0074	+0.0002	20
V	533.4168	.0001	-0.0075	+0.0002	36

From 1973 to 1976 the period has been decreasing (Baldinelli, Ghedini 1977) with:

$$\frac{dp}{p} \simeq -0.1 \times 10^{-5}$$



The O-C diagram, reported in the figure, contains the values indicated in the list and those of Mallama (1977) and Bønes, Mirabø (1977). All the O-C are referred to the elements (1). The diagram shows that the period has begun to increase again.

L. BALDINELLI, S. GHEDINI
"Guido Horn D'Arturo Observatory", Bologna, Italy
C.P. 1630, 40100 Bologna AD

References:

Baldinelli, L., Ghedini, S. 1977, Mem.S.A.It., 48, 83.
Bønes, J., Myrabø, H.K. 1977, I.B.V.S., 1316.
Cester, B. Pucillo, M. 1973, Mem.S.A.It., 64, 201.
Mallama, A.D. et al. 1977, I.B.V.S., 1249.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1481

Konkoly Observatory
Budapest
1978 October 3

OBSERVATION OF THE PECULIAR ECLIPSING VARIABLE ER VULPECULAE

The peculiar eclipsing binary system ER Vul, HD 200391 = BD + 27°3952 (α_{1900} = $20^h58^m07^s$, δ_{1900} = +27°24.8) was discovered as spectroscopic binary in 1946 at David Dunlap Observatory by Northcott and Bakos (1956) through an interval of two years. It was suspected as eclipsing binary by Bakos who carried out photoelectric observation and confirmed the light variation. The photometric observations are discussed by Northcott and Bakos (1967). Also Abrami and Cester (1963) have observed the star in B and V filters and presented a solution of the geometrical elements based on the dynamical equilibrium ratio relating stellar masses and radii. The star has been listed by Hall (1976) in the table of short period group of the RS CVn binaries, the spectral type GOV + G5V.The H and K emission lines were observed in the spectrum by Bond (1970) (see also Eggen 1978).

The light curve was obtained in two colours from 1000 photoelectric observations made with the 48 cm Cassegrain telescope of the Ege University Observatory. The telescope was equipped with an unrefrigerated 1P21 photomultiplier with B and V filters of the UBV system during a two-week period in July-August 1978. Two stars in the neighbourhood of the variable were selected as comparison and check star, HD 200270 and HD 200425, respectively.

The observations have been reduced in phase by using the light element Hel.J.D. Min.1 = 2440182.266 which is given by Battistini et al.(1974) and the period P=0.698096 days which was calculated by Northcott and Bakos (1967). Accordingly the O - C values derived for the primary and secondary minimum in the blue light are given in Table 1.

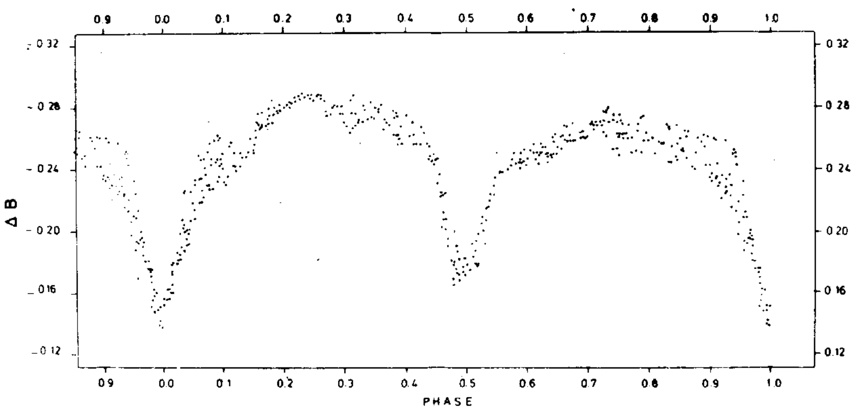


FIG.(1) B LIGHT CURVE OF ER VUL

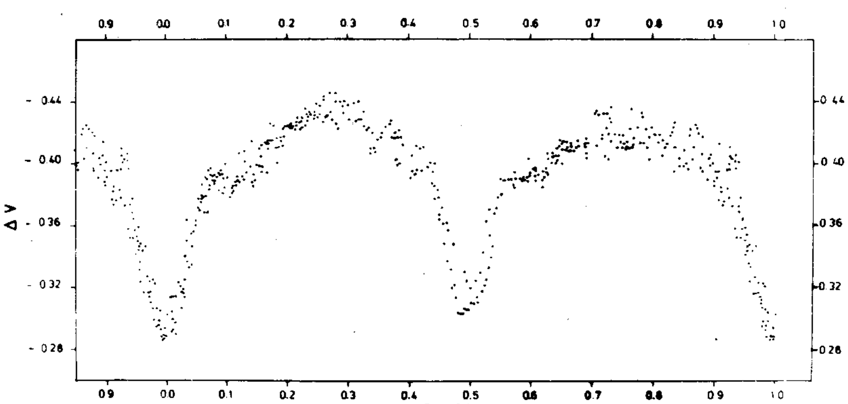


FIG.(2) V LIGHT CURVE OF ER VUL

Table 1

Epochs of minima of ER Vul

Type of Min.	J.D.Hel	O - C	Ref.
I	2438722.545	0.000	Northcott & Bakos
I	9029.705	-0.002	" (1967)
II	8672.629	-0.002	"
II	8700.555	0.000	"
I	2443724.3856	-0.0188	Present work
I	3731.3679	-0.0169	"
II	3718.4566	-0.0144	"
II	3730.3222	-0.0168	"

Our observation indicates irregular light curve variations. In Figures 1 and 2 the light curve of ER Vul in the two colours B and V respectively is represented as a function of phase (using the new calculated linear ephemeris from the O - C values (Table 1), namely; Hel.J.D.Min.I.= $2440182.3212+0^{d}.698082 \cdot E$. The peculiarities are mainly a great variability in the levels of the outside eclipses and in the depth of the secondary minimum, this phenomenon shown also in the light curve of RT And (Mancuso et al. 1978). It is remarkable that the maximum of ER Vul appears unsymmetrical which is confirmed also in the light curve of Northcott & Bakos (1967). The star will be observed again at Kottamia Observatory in the near future. In the forthcoming paper the light curve of the system will be analysed for determining the different physical and geometrical elements.

I would like to thank Professor Kizilirmak and his staff of Ege University Observatory particularly Dr.M. Kurutec for the continuous help and discussion during the observation time of ER Vul.

HAMID M. AL-NAIMIY

Scientific Research Foundation
Astronomical Observatory Unit
Jadriyh - Baghdad - Iraq

References:

Abrami, A. and Cester, B. 1963, Ossero.Astr.di Trieste, No.320

Battistini, P.,Bonifazi, A. and Guarnieri, A. 1974, I.B.V.S.No.951

Bond, H.E. 1970, Pub.A.S.P. 82, 321

Eggen, O.J. 1978, I.B.V.S. No.1426

Hall, D.S. 1976, Proc.of IAU Coll.No.29(Budapest),Part 1,287

Mancuso, S.,Milano,S.,Russo,G.,Sollazzo,C.1978, I.B.V.S.No.1409

Northcott, R.J. and Bakos, G.A. 1956, Astron.J. 61, 188

Northcott, R.J. and Bakos, G.A. 1967, Astron.J. 72, 89

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1482

Konkoly Observatory
Budapest
1978 October 6

DETECTION OF EMISSION LINES OF HOT PLASMA IN FIVE PECULIAR ECLIPSING BINARY SYSTEMS

In the course of our observations of the far ultraviolet spectra of eclipsing binary stars with the IUE satellite, we detected strong emission lines in the spectra of the five binary systems (other than β Lyr) listed in Table 1. The emission spectrum is richest in SX Cas. For RX Cas and W Ser the spectra are surprisingly similar, while fewer emission lines are observed in W Cru and V367 Cyg. Nevertheless, the basis pattern is the same, and is well represented by the most prominent emission features seen in W Ser, listed in Table 2. In addition to these lines, the spectrum between λ1200 and λ2000 Å shows over 30 other emission features. Most of these features are blends of two or more components, since the resolving power of the low-dispersion IUE spectrograph is only 6 Å.

The high level of ionization indicated by strong emission lines of Si IV, C IV, and N V is remarkable. It is not yet clear from which region or regions of the systems these emissions come. One possibility is a high temperature, low density plasma surrounding the hotter component. It should be noted that the hot component may well be the spectrographically invisible one if it is surrounded by an optically thick disk of gas. All five systems listed in Table I are most likely at a phase of rapid mass transfer or mass loss, so the presence of a large cloud as well as a thick disk is quite plausible. The hotter component may in turn be a collapsed object or a more "normal" accreting star. Emission lines of N V are known to be associated with stars earlier than O9. Although we have detected blue continua in the systems listed in Table 1, they do not seem to correspond to the continua of O stars. Additionally, the total luminosity of each system does not suggest the presence of a normal O star. Therefore the ionization is probably not due to blackbody thermal radiation, but it may still be radiatively induced, if we assume absorption of X rays generated near the secondary star. Their origin is straightforward if we surmise a collapsed object. In the case of a non-collapsed star later than O-type, one can conjecture X radiation generated by accretion shocks.

It is also possible that the emitting plasma lies in a very extended chromosphere and/or corona of the mass-losing component, perhaps created by an unusually strong stellar wind.

Decision about the location of the emitting plasma is not easy since the low dispersion does not permit accurate measurement of the radial velocities. Also, the phase dependence of the phenomenon is unknown at this time. All five systems listed in Table 1 are very peculiar, and, from previous observations with Copernicus, β Lyr is reasonably included in the list. The presence of a black hole in β Lyr, W Ser, W Cru, and V367 Cyg is a distinct possibility. On the other RX Cas and SX Cas are probably stronger cases for the stellar wind alternative. It may be dangerously misleading that we concentrated on peculiar systems. Certainly the occurrence of the phenomenon in various classes of binary stars is yet to be tested, However, we have not observed this type of emission spectrum in ε Aur, μ Sgr, TT Hya, RZ Sct, U CrB, to mention just a few of the systems already surveyed.

MIREK PLAVEC
University of California
Los Angeles

ROBERT H. KOCH
University of Pennsylvania
Philadelphia

Table 1

Binary Systems Showing Emission Lines of Hot Plasma

Name	Period (days)	$f(\mathfrak{M})(\odot)$	Spectral type
RX Cas	32.3	0.16:	A5e III + (G3 III)?
SX Cas	36.6	0.31:	A6e III + (G6 III)?
W Cru	198.5	5.82	G1e Iab
V367 Cyg	18.6	1.56:	A5e Iab? (shell!)
β Lyr	12.9	8.5	B8e II
W Ser	14.2	0.35:	F5e Ib (shell)

Note: β Lyr was not observed in this program. However, previous observations with Copernicus (Hack et al., 1975, Astrophys J. 198, 453) justify its inclusion in our list.

Table 2

Major Emission Lines Detected in W Ser

1200Å - 1950Å

Observed λ (A)	Identification Ion	λ(A)	Possible Contributors	Comments
1213	H I (Ly α)	1216		geocoronal
1240	N V(1)	1239,1243		
1263	Si II(4)	1265		
1306	O I(2)	1302-1306	Si II(3), [O V] ?	
1335	C II(1)	1335,1336	Si III(34)	
1394	Si IV(1)	1394		
1401	Si IV(1)	1403	O IV 1401,1405	
1549	C IV(1)	1548,1551		
1641	He II	1641		very broad
1672	Al II(2)	1671		
1766	Al II(5)		O III, Fe II	
1783	Si III(35)		Ni II(5)	reseau-contaminated
1808	Si II(1)	1808	Ni II(2)	
1816	Si II(1)	1817		
1856-62	Al III(1)	1855,1863	Si III, Al II, Fe III	very broad
1888-93	Si III(1)	1892	Fe III, N II?, P IV?	very broad
1910	C III	1909	Fe III	reseau-contaminated
1925	C II	1927,1928	Fe III	reseau-contaminated

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1483

Konkoly Observatory
Budapest
1978 October 6

THE PERIOD VARIABILITY OF THE CLOSE BINARY W SERPENTIS

The ephemeris for W Ser (HD166126:F5e Ib) can be improved beyond the representation by Wood and Forbes (1973). The published timings of minimum light available to the present authors are those derived from visual estimates by Zinner (1912, 1922), Banachiewicz (1928a,b), Lause (1930), Bauer (1945), Zacharov (1954) and Tsesevich (1955); photographic estimates by Gaposchkin (1937) and Filin (1948); visual observations by McLaughlin (1961); and photoelectric measures by Fresa (1957, 1962), Lynds (1957), Hall (1967), Walraven (1969) and Kruszewski (1972). In addition, E. F. G. observed two times (in the b-bandpass) with a photoelectric photometer equipped with an RCA 4509 multiplier at Biruni Observatory, Pahlavi University, Shiraz, Iran: 2443363.23 and 2443646.675. The photographic estimates by O'Connell (1937) were not available to the present authors. Fifty four timings of minimum light were accumulated and were assigned weights of 1, 2, and 3 according to the measurements being estimates, visual observations, or photoelectric observations, respectively. Residuals were first computed from the ephemeris:

$$\text{Pr. Min.} = 2426625.241 + 14.15782\,E, \qquad (1)$$

and these residuals were then subjected to least squares polynomial fitting. A quadratic fit is definitely inferior to a cubic one and the latter is shown among the residuals in the figure. The improved ephemeris becomes:

$$\text{Pr. Min.} = 2426625.493 + 14.15486E + (3.140\times10^{-6})E^2 + (1.432\times10^{-9})E^3. \qquad (2)$$

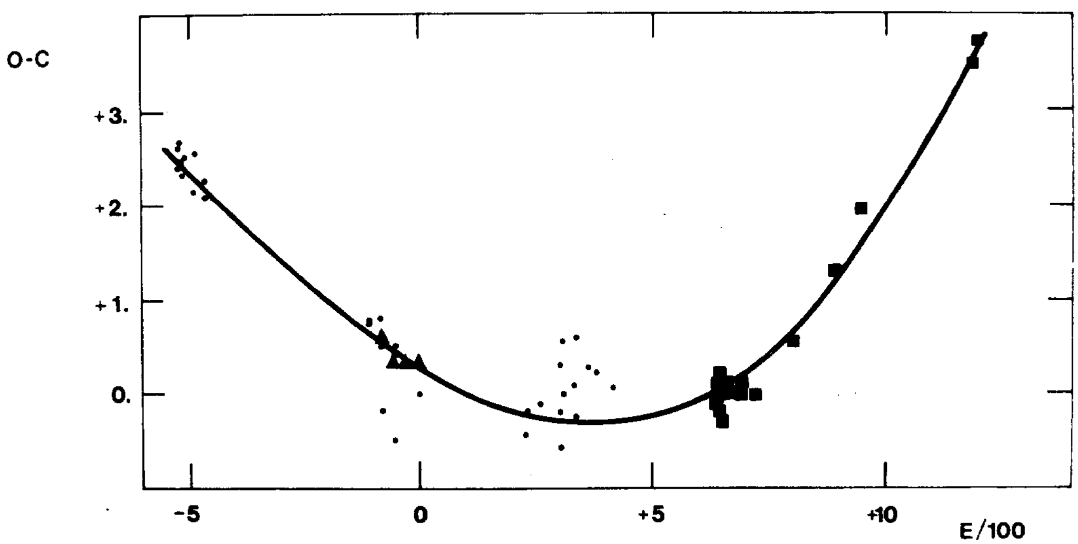
If the cubic term is ignored, the period change may be evaluated:

$$\Delta P = 0.54 \text{ sec/cycle},$$

$$\frac{\Delta P}{P} = 4.44 \times 10^{-7}.$$

This period change is comparable to the recent ones for β Lyr (Herczeg 1973) and RX Cas (Kreiner 1978).

It may be noted that the present phases of the (O-C)-diagrams for W Ser and RX Cas appear to be similar to each other. In another communication, Plavec and Koch (1978) remark upon the similarity of the satellite UV



The (O-C) diagram from equation (1) for W Ser. Small circles refer to visual or photographic estimates, triangles refer to visual observations, and squares refer to photoelectric measures. The curve represents equation (2).

spectra of these two systems. It will be interesting to see if their respective period changes can be correlated in any way with the richness of the emission spectra and, by inference, with the vigor of the presumed mass transfer. Plavec and Koch also note that the emission spectrum of SX Cas is stronger than that for RX Cas and W Ser, and from Whitney's (1978) period study it is possible to infer that SX Cas is at a phase in its period variation different from that of the two other systems.

An approximation to a linear ephemeris after E = + 715 (from (1) and (2)) may be suggested:

$$\text{Pr. Min.} = 2436748.10 + 14.16540E' . \tag{3}$$

R. H. KOCH
Department of Astronomy
University of Pennsylvania
Philadelphia, PA 19104

E. F. GUINAN
Department of Astronomy
Villanova University
Villanova, PA 19085

and

Biruni Observatory
Pahlavi University
Shiraz, Iran

References:

Banachiewicz, T. 1928a, S.A.C. 6, 66
Banachiewicz, T. 1928b, S.A.C. 6, 69
Bauer, C.A. 1945, Ap.J. 101, 208
Fresa, A. 1957, A.J. 62, 362
Fresa, A. 1962, M.S.A.I. 33, 151
Filin, A.Ya. 1948, Perem.Zvezdy 7, 90
Gaposchkin, S. 1937, H.A. 105, 511
Hall, R.C. 1967, A.J. 72, 778
Herczeg, T.J. 1973, I.B.V.S. No.820
Kreiner, J.M. 1978, I.B.V.S. No. 1403
Kruszewski, A. 1972, A.A. 22, 405
Lause, F. 1930, A.A.c 1, 98
Lynds, C.R. 1957, Ap.J. 126, 81
McLaughlin, D.B. 1961, A.J. 66, 351
O'Connell, D.J.K. 1937, Ann.Bosscha Lembang 8, 22
Plavec, M. and Koch, R.H. 1978, I.B.V.S. No. 1482
Tsesevich, V.P. 1955, Odessa Izv. 4, 6
Walraven, J.H. 1969, I.B.So.Hem. 15, 40
Whitney, B.S. 1978, I.B.V.S. No.1430
Wood, D.B. and Forbes, J.E. 1963, A.J. 68, 257
Zacharov, G.P. 1954, Perem. Zvezdy 10, 48
Zinner, E. 1912, A.N. 190, 377
Zinner, E. 1922, A.A.A.N. 4 (3), C1

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1484

Konkoly Observatory
Budapest
1978 October 16

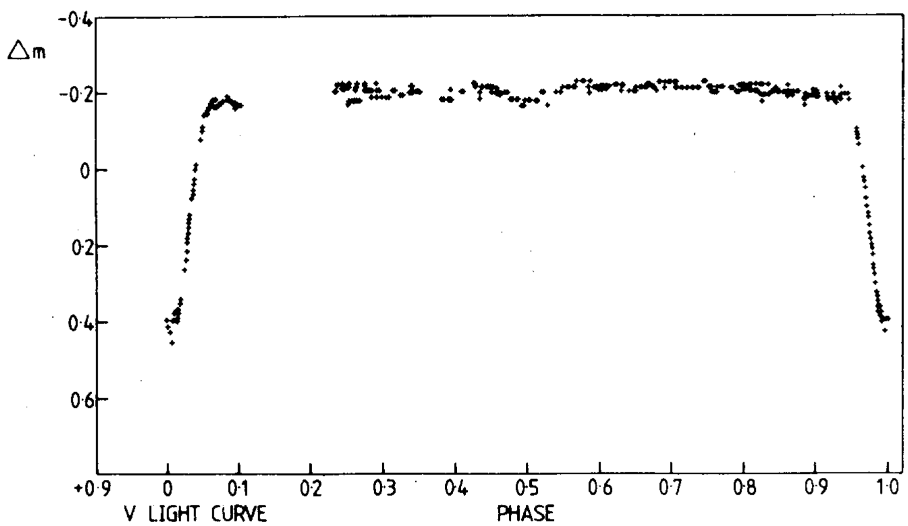
WY Cnc - A PUZZLING SMALL-SCALE ALGOL SYSTEM

The variability of the short period ($0^{d}.829$) eclipsing binary WY Cnc was recognized by Hoffmeister (1949), though it was Kippenhahn (1953) who first pointed out its Algol type pattern of light variability. Chambliss (1965) published a two colour photoelectric investigation of the system as a result of which he was able to produce a set of geometric elements. The system has been observed subsequently by Ahnert (1973) and again by Chambliss (1975), the former having reported essential constancy of the orbital period over a forty year interval.

Popper (1976), who gave the predominant spectral type as G5, included the star in a list of close binaries exhibiting the H and K lines in emission, as a result of which, perhaps, the star has been included in the "short period" group of RS CVn like binaries studied by Hall (1976). One of the more salient puzzles appears at this stage in the actual appearance of the light curve, i.e., the deep primary and very low level of proximity induced photometric distortion - the short period and intermediate spectral type notwithstanding.

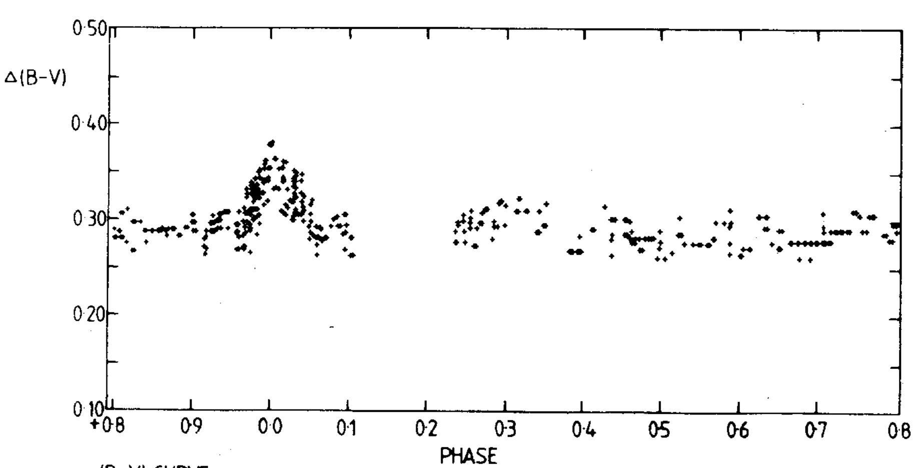
Unfortunately, there appears to be no published radial velocity curve for the system. Popper (1976) identifies the source of the emission lines to be the primary and notes (private communication) that in this respect it is the only exception in his list. This point is perplexing, however, since according to analysis of Chambliss (1965) it is the slightly more luminous star which remains uneclipsed at the occultation (primary) minimum.

From some preliminary results obtained with the 3 prism Cassegrain spectrograph of the 74 inch reflector at Kottamia we can make a tentative identification at elongation of weak emission features in the H and K lines, though we would tend not to associate them, on the basis of apparent Doppler shift, with the predominant G type (primary) spectrum, but we have no conclusive measurements about this as yet.



-0·4
Δm
-0·2
0
0·2
0·4
0·6
+0·9
0
0·1
0·2
0·3
0·4
0·5
0·6
0·7
0·8
0·9
1·0
V LIGHT CURVE
PHASE

Fig. 1.



0·50
Δ(B−V)
0·40
0·30
0·20
0·10
+0·8
0·9
0·0
0·1
0·2
0·3
0·4
0·5
0·6
0·7
0·8
PHASE
(B−V) CURVE

Fig. 2

Another problem concerning this primary star is its small size. Even if the mass of the system were as much as 6 solar masses the Chambliss solution yields the primary radius to be still only two thirds that of the Sun.

We have re-observed the system photoelectrically in B and V colours using the photometric arrangement described by Sadik (1978). The main comparison star was BD 27° 1700 with occasional checks being made on BD 27°1699. The phases of WY Cnc were computed from the ephemeris

$$\text{JD Hel Min I} = 2426352.3895 + 0\overset{d}{.}82931722\ E.$$

We can confirm the essential features of the light curve as given by Chambliss, though there may be some minor differences. It is planned to re-analyze the system, and to obtain more spectrograms when the star again becomes favourably placed for observation.

N.S. AWADALLA and E. BUDDING

Department of Astronomy,
University of Manchester,
Manchester, England.

References:

Ahnert, P.: 1973, MVS, Sonneberg 6, 107

Chambliss, C.R.: 1965,Astron.J. 70, 741

Chambliss, C.R.: 1975, I.B.V.S. No. 1029

Hall, D.S.: 1976, Proc.I.A.U.Coll.No.29 (Budapest),Part I, p.287, Reidel, Dordrecht

Hoffmeister, C.: 1949, Astron.Abh. 12, 422

Kippenhahn, R.: 1953, Nachr.Astr.Zentralstelle 7 Ann. No. 3

Popper, D.M.: 1976, I.B.V.S. No. 1083

Sadik, A.R.: 1978, I.B.V.S. No. 1381

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1485

Konkoly Observatory
Budapest
1978 October 17

UNE NOUVELLE ETOILE DE TYPE RR LYRAE DANS LEO

En établissant des séquences photométriques stellaires au voisinage de certaines radiosources nous avons observé une nouvelle étoile variable, en Janvier 1977. Cette étoile présentait des variations de brillance de l'ordre de une magnitude dans la couleur V, accompagnées de changements de couleur.

Elle est située dans le champ du quasar OL 108,1 (PKS 1004 +141), 80" au nord et 23" à l'est de l'étoile BD 14°2203. Sur la figure 1 nous avons également noté les positions de l'étoile BD 14°2204 et du quasar OL 108,1 ainsi que celles de deux étoiles

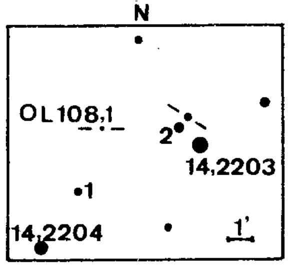


Figure 1

de comparaison notées 1 et 2. Les coordonnées de l'étoile variable sont:

$$\alpha_{1950} = 10^{H}04^{mn}\ 43,4^{s} \pm 0,2^{s} \quad \delta_{1950} = +14^{o}11'39'' \pm 2''$$

Entre Janvier 1977 et Avril 1978, nous avons obtenu 23 mesures photoélectriques, dans le système U B V, à l'aide du télescope de 1 m. de l'Observatoire de La Silla (E.S.O., Chili) (cf. tableau 1). L'erreur quadratique moyenne sur ces mesures est σ=0,03. Les étoiles de comparaison ont pour magnitudes:

	Nombre de mesures	V	B - V	U - B
*14.2203	5	9,18 ± 0,03	1,37 ± 0,01	1,68 ± 0,01
* 1	9	14,88 ± 0,04	0,75 ± 0,06	0,25 ± 0,08
* 2	8	13,22 ± 0,03	0,62 ± 0,02	0,14 ± 0,03

Nous avons analysé ces résultats par la méthode d'autocorrélation développée par Lafler et Kinman (1965) et utilisée par

Véron et Véron (1976).

La période ainsi obtenue est:

$$P = 0{,}57681 \pm 0{,}00002 \text{ j}$$

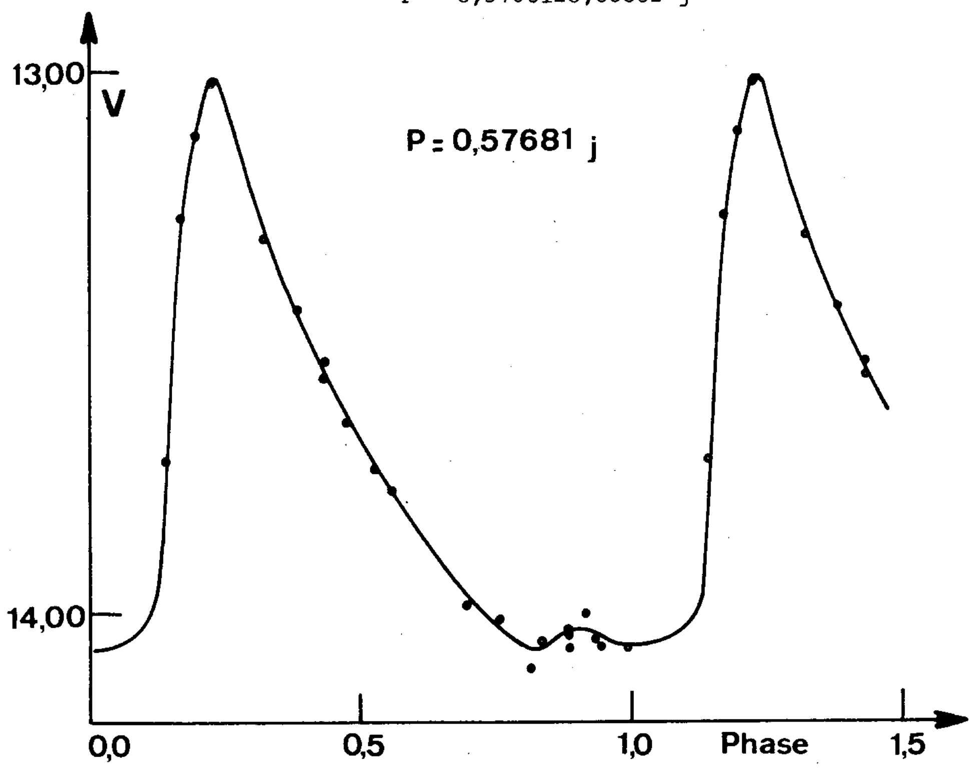


Figure 2

La figure 2 donne la courbe de lumière de l'étoile et les figures 3 et 4 montrent les variations des indices de couleurs B-V et U-B sur une période. La courbe obtenue est très semblable à celle de la variable de type RR Lyrae V 675 Sgr (Lub, 1977) avec probablement un petit maximum secondaire lorsque l'étoile est faible.

Nous avons également obtenu un spectre à faible dispersion (171 Å/mm) de cette étoile, dans le bleu, avec le Spectrographe Boller et Chivens du télescope de 3,6 m de l'ESO, un peu après son maximum d'éclat. Le spectre est celui d'une étoile de type voisin de A3.

La forme de la courbe de lumière, les variations d'indice de couleur et le spectre près du maximum montrent qu'il s'agit réellement d'une étoile de type RR Lyrae.

Tableau 1

MESURES PHOTOELECTRIQUES

Date TU			V	B - V	U - B	Phase
1977	JAN	18,298	13,74	0,33	0,11	0,52
		19,267	13,12	0,13	0,14	0,20
		20,236	14,08	0,42	0,03	0,88
		22,285	13,54	0,27	0,21	0,43
1978	JAN	11,294	13,27	0,08	0,19	0,17
		11,335	13,02	0,07	0,14	0,24
		12,279	14,05	0,35	0,04	0,88
		12,295	14,01	0,45	-0,05	0,91
		12,313	14,07	0,39	0,01	0,94
		12,342	14,07	0,36	0,02	0,99
		13,325	13,99	0,37	0,07	0,69
		16,317	14,05	0,39	0,04	0,88
	FEV	15,238	14,02	0,46	0,06	0,75
		16,273	13,78	0,33	0,13	0,55
	MAR	12,145	14,05	0,42	0,01	0,93
		13,230	14,11	0,40	0,06	0,81
		14,184	13,65	0,30	0,20	0,47
		15,149	13,72	0,23	0,06	0,14
		16,123	14,06	0,36	0,06	0,83
	AVR	2,131	13,31	0,18	0,22	0,32
		2,165	13,44	0,26	0,19	0,38
		2,197	13,57	0,29	0,18	0,43
		4,078	13,99	0,41	0,07	0,69
1978	FEV	2,33	~ 13,4	spectre 171 Å/mm		0,37

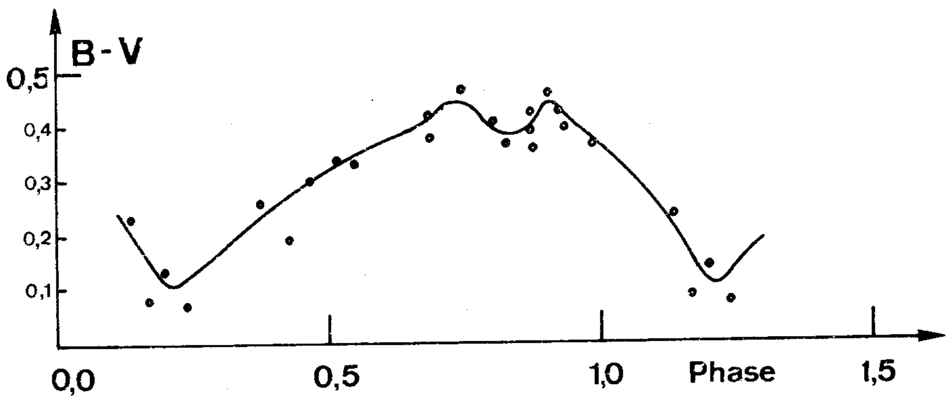


Figure 3

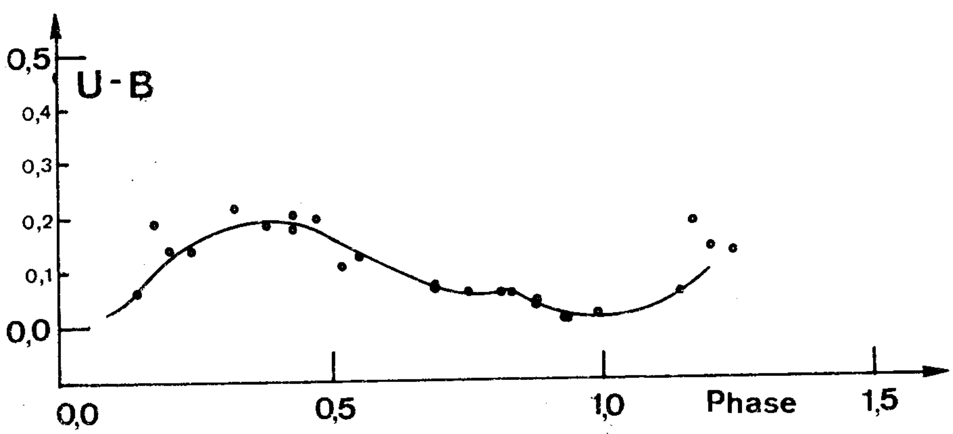


Figure 4

G. LELIÉVRE, G. WLÉRICK, CH. BERTAUD
Observatoire de Paris-Meudon
G. ADAM
Observatoire de Lyon

References:

Lafler, J., Kinman, T.D. 1965, Astrophys.J.Suppl. 2, 199
Lub, J. 1977, Astron. Astrophys.Suppl. 29, 345
Véron, M.P., Véron, P. 1976, I.B.V.S. No. 1155

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1486

Konkoly Observatory
Budapest
1978 October 17

PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR AD Leo IN 1974

Continuous photoelectric monitoring of the flare star AD Leo has been carried out at the Stephanion Observatory ($\lambda=-22^{\circ}49'44''$, $\varphi=+37^{\circ}45'15''$) during the year 1974 using the 30-inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV system. The telescope and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:
for the time interval from 16-1-1974 to 9-4-1974

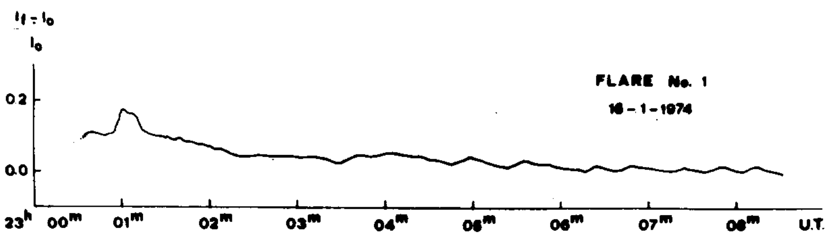
$$V = v_o + 0.030\ (b-v)o + 1.756,$$
$$B-V = 0.845 + 1.042\ (b-v)o,$$
$$U-B = -1.778 + 1.102\ (u-b)o,$$

and from the time interval from 17-4-1974 to 26-5-1974

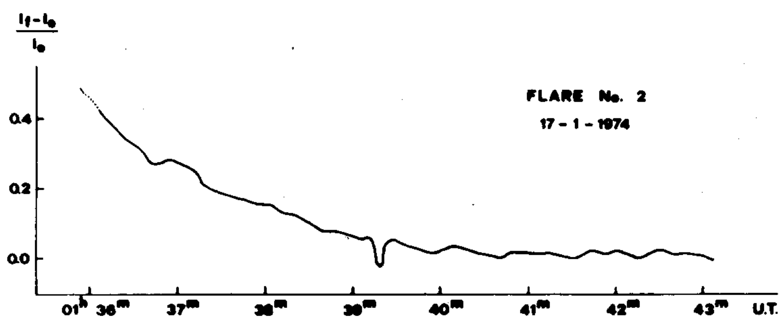
$$V = v_o - 0.011(b-v)o + 2.445,$$
$$B-V = 0.848 + 0.992(b-v)o,$$
$$U-B = -1.632 + 0.999(u-b)o.$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in the Table I. Any interruption of more than one minute has been noted. In the fourth column of Table I the standard deviation of random noise fluctuation $\sigma(\text{mag}) = 2.5 \log(I_o+\sigma)/I_o$ for different times (UT) of the corresponding monitoring interval is given.

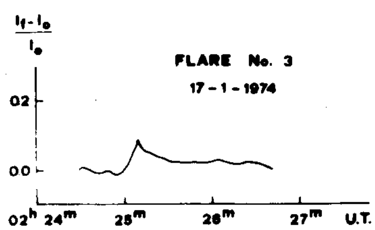
During the 40.85 hours of monitoring time 8 flares were observed the characteristics of which are given in Table II. For each flare following characteristics (Andrews et al., 1969) are given: a) the date and universal time of flare maximum, b) the duration before and after the maximum (t_b and t_a, respectively), as well as the total duration of the flare, c) the value of the ratio $(I_f-I_o)/I_o$ corresponding to flare maximum, where I_o is the intensity deflection



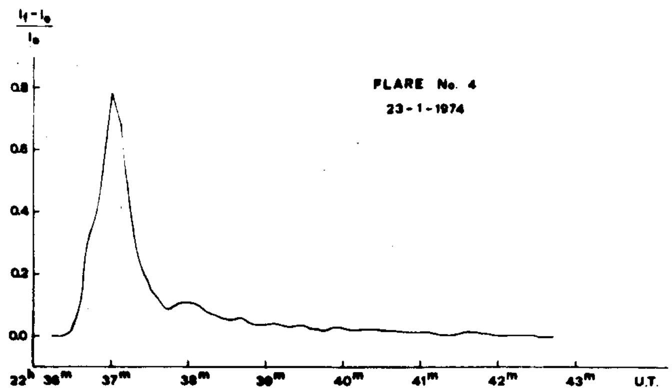
If - Io
Io
0.2
0.0
FLARE No. 1
16 - 1 - 1974
23h 00m
01m
02m
03m
04m
05m
06m
07m
08m
U.T.

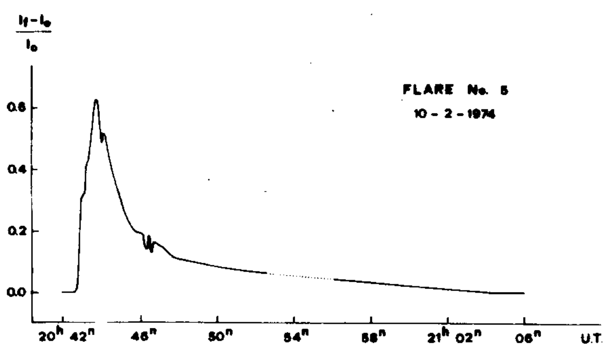


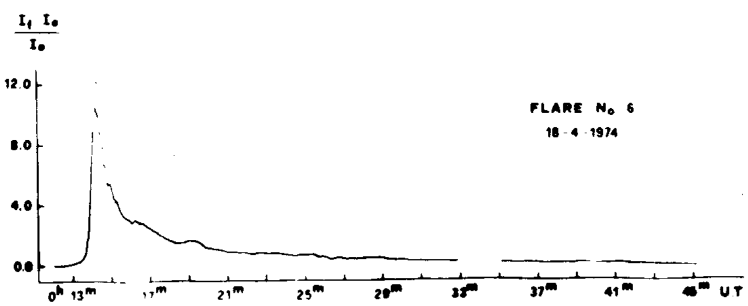
If - Io
Io
0.4
0.2
0.0
FLARE No. 2
17 - 1 - 1974
01h 36m
37m
38m
39m
40m
41m
42m
43m
U.T.

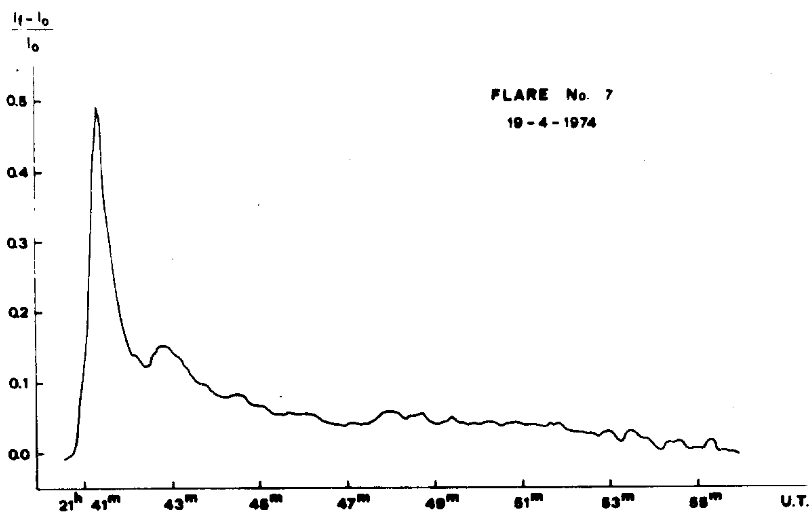


If - Io
Io
FLARE No. 3
17 - 1 - 1974
0.2
0.0
02h 24m
25m
26m
27m
U.T.

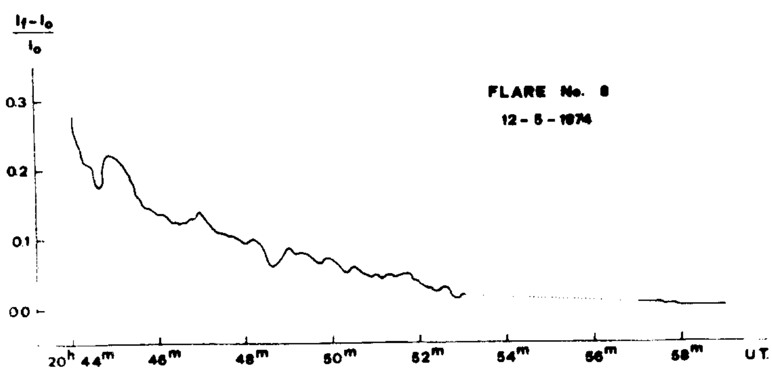

$\frac{I_f - I_o}{I_o}$
FLARE No. 4
23 - 1 - 1974
0.8
0.6
0.4
0.2
0.0
22h 36m
37m
38m
39m
40m
41m
42m
43m
U.T.


$\frac{I_f - I_o}{I_o}$
FLARE No. 5
10 - 2 - 1974
0.6
0.4
0.2
0.0
20h 42m
46m
50m
54m
58m
21h 02m
06m
U.T.


$\frac{I_f \; I_o}{I_o}$
FLARE No 6
18 - 4 - 1974
12.0
8.0
4.0
0.0
0h 13m
17m
21m
25m
29m
33m
37m
41m
45m
U.T



$\frac{I_f - I_0}{I_0}$
FLARE No. 7
19 - 4 - 1974
0.5
0.4
0.3
0.2
0.1
0.0
21h 41m
43m
45m
47m
49m
51m
53m
55m
U.T.



$\frac{I_f - I_0}{I_0}$
FLARE No. 8
12 - 5 - 1974
0.3
0.2
0.1
0.0
20h 44m
46m
48m
50m
52m
54m
56m
58m
U.T.

Flare Star AD Leo,

Table I

Date 1974	Monitoring intervals (U.T.)	Total Monitoring Time	σ (U.T.)
January			
I6	$23^h00^m.64 - 23^h09^m, 23^hI4^m - 23^h23^m$,		$0.0I(23^h33^m)$
	23 25 -23 36 ,23 39 -24 00 ,	$00^h49^m.36$	
I7	00 00 -00 09.40,00 I2.05 -00 I7 ,		$0.0I(00^h07^m),0.0I(00^h38^m)$,
	00 24 -00 4I ,0I 36 -02 0I ,		$0.0I(0I^h58^m),0.02(02^hI7^m)$,
	02 03 -02 I5 ,02 I7 -02 30 ,		$0.0I(02^h47^m),0.02(03^h2I^m)$,
	02 34 -03 06 ,03 08 -03 I4 ,		$0.02(03^h58^m),0.02(23^hI6^m)$,
	03 2I -04 0I ,22 53 -23 I8 ,		$0.02(23^h47^m)$.
	23 22 -23 33 ,23 37 -24 00 .	$3^h37^m.9$	
I8	00 00 -00 08 ,00 I3 -00 I9 ,		$0.0I(00^h3I^m),0.0I(0I^h29^m)$,
	00 22 -00 38 ,0I 25 -0I 45 ,		$0.02(02^h00^m),0.0I(02^h40^m)$.
	0I 49 -02 I5 ,02 I8 -02 47 .	I^h45^m	
20	22 I4 -22 47 ,22 5I -23 II .	53^m	$0.02(22^hI6^m),0.02(22^h53^m)$.
23	22 29 -22 5I ,22 54 -22 58 ,		$0.0I(22^h34^m),0.02(23^h07^m)$,
	23 04 -23 26 ,23 33 -23 50 .	I^h05^m	$0.0I(23^h45^m)$.
February			
I0	20 25 -20 53 ,20 56 -2I 22 ,		$0.0I(20^h39^m),0.0I(2I^h09^m)$,
	2I 27 -2I 50 ,22 00 -22 34 ,		$0.02(2I^h4I^m),0.0I(22^hI5^m)$,
	22 4I -23 II ,23 I5 -23 38 .	2^h44^m	$0.0I(23^h0I^m),0.0I(23^h29^m)$.
II	00 38 -0I 05 ,0I I0 -0I 37 ,		$0.0I(00^h58^m),0.02(0I^h28^m)$,
	0I 4I -02 I8 .	I^h3I^m	$0.02(02^h00^m)$.
April			
3	22 05 -22 33 ,22 39 -23 03 ,		$0.II(22^h28^m),0.I2(22^h43^m)$,
	23 07 -23 37 .	I^h22^m	$0.I5(23^hI3^m)$.
7	I9 30 -I9 59 ,20 03 -20 30 ,		$0.03(I9^h38^m),0.04(20^hI2^m)$,
	20 33 -2I 02 ,2I 22 -2I 47 ,		$0.04(20^h58^m),0.04(2I^h44^m)$,
	2I 5I -22 23 ,22 28 -22 59 .	2^h53^m	$0.05(22^hI7^m),0.05(22^h56^m)$.
9	20 I5 -20 43 ,20 48 -20 58 ,		$0.02(20^h36^m),0.03(2I^h48^m)$,
	2I 29 -22 00 ,22 I4 -22 43 ,		$0.02(22^h34^m),0.03(23^h09^m)$.
	22 46 -22 50 ,22 57 -23 I4 .	I^h59^m	
I7	22 20 -22 5I ,23 22 -23 5I ,		$0.0I(22^h35^m),0.0I(23^h27^m)$.
	23 54 -24 00 .	$I^h\ 6^m$	

Table I (Continued)

I8	00^h00^m–00^h46^m.	46^m	$0.02(00^hII^m)$.
I9	20 30 -20 59 ,2I 03 -2I 30 ,		$0.0I(20^h47^m)$,$0.0I(2I^hI4^m)$,
	2I 34 -2I 59 ,22 I3 -22 45 ,		$0.0I(2I^h39^m)$,$0.0I(22^h28^m)$,
	22 49 -23 25 ,23 28 -24 00 ,	3^h0I^m	$0.0I(23^h02^m)$,$0.02(23^h44^m)$.
20	00 00 -00 02 .	2^m	
23	20 30 -20 58 ,2I 0I -2I 3I ,		$0.0I(20^h34^m)$,$0.0I(2I^hI8^m)$,
	2I 34 -22 03 ,22 I8 -22 50 ,		$0.0I(2I^h48^m)$,$0.0I(22^h38^m)$,
	22 53 -23 I9 .	2^h25^m	$0.0I(23^h04^m)$.
May			
7	2I 22 -2I 3I ,2I 32 -2I 45 ,		$0.02(2I^h35^m)$,$0.02(22^h05^m)$,
	2I 5I -22 00 ,22 0I -22 I4 ,		$0.03(22^h36^m)$.
	22 30 -22 39 ,22 42 -22 5I ,		
	23 07 -23 I6 ,23 I9 -23 26 .	$0I^hI8^m$	
9	I9 47 -I9 54 ,I9 56 -20 02 ,		$0.0I(20^h00^m)$,$0.0I(20^h24^m)$,
	20 05 -20 I3 ,20 I8 -20 30 ,		$0.02(2I^h4I^m)$,$0.02(22^hI6^m)$.
	2I 39 -2I 49 ,2I 53 -22 02 ,		
	22 II -22 20 .	$0I^h0I^m$	
I0	20 09 -20 I8 ,20 20 -20 27 ,		$0.0I(20^h25^m)$.
	20 29 -20 36 ,	23^m	
II	I9 I9 -I9 25 ,I9 27 -I9 33 ,		$0.0I(I9^h30^m)$,$0.0I(20^h02^m)$,
	I9 35 -I9 47 ,I9 5I -I9 58 ,		$0.0I(20^h56^m)$,$0.0I(2I^h40^m)$,
	I9 59 -20 06 ,20 08 -20 I8 ,		$0.02(22^hI0^m)$,$0.03(22^h40^m)$.
	20 22 -20 34 ,20 40 -20 48 ,		
	20 53 -2I 04 ,2I 2I -2I 3I ,		
	2I 34 -2I 43 ,2I 46 -2I 55 ,		
	22 00 -22 05 ,22 07 -22 I5 ,		
	22 20 -22 26 ,22 35 -22 43 ,		
	22 46 -22 53 .	02^h2I^m	
I2	20 06 -20 I6 ,20 I9 -20 28 ,		$0.0I(20^h22^m)$,$0.02(2I^h06^m)$.
	20 29 -20 40 ,20 44 -20 53 ,		
	20 57 -20 59 ,2I 03 -2I I3 ,		
	2I I5 -2I 23 ,2I 26 -2I 37 ,	$0I^hI0^m$	
I3	I9 42 -I9 55 ,I9 56 -20 03 ,		$0.0I(I9^h57^m)$,$0.0I(20^h26^m)$,
	20 07 -20 I9 ,20 22 -20 34 ,		$0.0I(20^h43^m)$.
	20 39 -20 49 ,20 52 -2I 02 ,		
	2I 03 -2I I4 .	$0I^hI5^m$	

Table I (Continued)

I4	I9 57 -20 05 ,20 I0 -20 I6 ,		0.0I(20^{h}I3^m),0.02(20^{h}44^m).
	20 I9 -20 26 ,20 3I -20 40 ,		
	20 43 -20 52 ,20 56 -2I 02 .	45^m	
I7	I9 53 -20 00 ,20 03 -20 09 ,		0.0I(20^{h}2I^m),0.0I(20^{h}38^m),
	20 II -20 I7 ,20 I8 -20 3I ,		0.02(2I^{h}I9^m).
	20 35 -20 43 ,20 45 -20 54 ,		
	20 55 -2I 0I ,2I 05 -2I I3 ,		
	2I I5 -2I 22 ,2I 24 -2I 3I .	0I^{h}I7^m	
22	I9 32 -I9 40 ,I9 44 -I9 52 ,		0.0I(I9^{h}56^m).
	I9 54 -20 02 ,20 04 -20 I3 .	33^m	
23	I9 37 -I9 44 ,I9 46 -I9 5I ,		0.02(I9^{h}49^m),0.02(20^{h}24^m),
	I9 53 -I9 58 ,20 0I -20 07 ,		0.02(20^{h}59^m).
	20 I2 -20 I9 ,20 2I -20 29 ,		
	20 3I -20 37 ,20 46 -20 53 ,		
	20 56 -2I 0I ,2I 04 -2I I0 ,		
	2I I4 -2I 22 .	0I^{h}I0^m	
24	I9 43 -I9 5I ,I9 53 -I9 59 ,		0.0I(I9^{h}56^m),0.0I(20^{h}38^m),
	20 02 -20 I2 ,20 I4 -20 22 ,		0.0I(2I^{h}08^m).
	20 25 -20 33 ,20 35 -20 43 ,		
	20 45 -20 52 ,20 58 -2I 04 ,		
	2I 06 -2I I5 ,2I I7 -2I 25 ,		
	2I 28 -2I 32 .	0I^{h}22^m	
25	I9 49 -I9 59 ,20 03 -20 I4 ,		0.0I(20^{h}06^m),0.02(20^{h}46^m),
	20 I7 -20 25 ,20 3I -20 36 ,		0.02(2I^{h}22^m).
	20 38 -20 42 ,20 44 -20 49 ,		
	20 5I -20 57 ,2I 02 -2I 06 ,		
	2I I0 -2I I7 ,2I 20 -2I 25 ,		
	2I 3I -2I 36 ,2I 40 -2I 46 .	0I^{h}I6^m	
26	I9 54 -20 05 ,20 07 -20 I5 ,		0.0I(20^{h}2I^m),0.02(20^{h}35^m).
	20 I7 -20 27 ,20 30 -20 40 ,		
	20 43 -20 52 ,20 55 -2I 03 ,		
	2I 06 -2I II .	0I^{h}0I^m	
	Total	40^{h}5I^m	

Flare Star AD Leo, I974

Table II

Characteristics of the Flares Observed

Flare No.	Date 1974 January	U.T. max.	t_b min.	t_a min.	Duration Min	$(I_f-I_o)/I_o$ max.	P min	Δm mag.	σ mag.	Air mass
I	I6	$23^h01^m.04$?	0.44 ?	7.52 ?	7.96 ?	0.I75 ?	0.352 ?	0.I75 ?	0.0I	I.373
2	I7	0I 36.00 ?	-	>7.0	-	>0.4	>0.682	-	0.0I	I.058
3	I7	2 25.20	0.68	I.52	2.20	0.088	0.072	0.092	0.02	I.I04
4	23	22 37.0I	0.64	5.52	6.I6	0.784	0.6I9	0.628	0.0I	I.I68
	February									
5	I0	20 43.70	I.20	20.50	2I.70	0.630	2.240	0.530	0.0I	I.290
	April									
6	I8	00 I4.I4 ?	I.76	30.88	32.64	I0.890 ?	29.574	2.688 ?	0.02	2.689
7.	I9	2I 4I.30	0.60	I4.56	I5.56	0.492	I.025	0.435	0.0I	I.300
	May									
8	I2	20 44.00 ?	-	-	-	>0.280	>0.9I5	>0.265	0.0I	I.444

less sky background of the quiet star and I_f is the total intensity deflection less sky background of the star plus flare, d) the integrated intensity of the flare over its total duration, including pre-flares, if present, $p = \int(I_f-I_o)/I_o dt$, e) the increase of the apparent magnitude of the star at flare maximum $\Delta m(b)=2.5\log(I_f/I_o)$, where b is the blue magnitude of the star in the instrumental system, f) the standard deviation of random noise fluctuation $\sigma(mag) = 2.5 \log(I_o+\sigma)/I_o$ during the quiet - state phase immediately preceding the beginning of the flare and g) the air mass at flare maximum. The light curves of the observed flares in the b colour are shown in Figs. 1-8.

M.E. CONTADAKIS, G. KAREKLIDIS
L.N. MAVRIDIS, D. STAVRIDIS, H. ZERVAKI-ZOEROU
Department of Geodetic Astronomy
University of Thessaloniki

Reference:

Andrews, A.D., Chugainov, P.F., Gershberg, R.E. and Oskanian, V.S.: 1969, I.B.V.S. No. 326

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1487

Konkoly Observatory
Budapest
1978 October 17

A NEW EXTREME LIGHTCURVE OF THE W UMa SYSTEM TZ BOOTIS

Photometric observations by Binnendijk (1969), Carr (1971) and Hoffmann (1978) revealed the very strong variations of the lightcurve of TZ Bootis. This W UMa system should be classified as W type, although the considerably deeper transit minima of 1967 and 1975 suggest the opposite. Such a behaviour is known only for very few systems. In three subsequent nights in April 1978 the observations of TZ Bootis with the double beam photometer at the 106cm telescope of Hoher List Observatory could be continued. The B measurements are shown in Figure 1 together with the 1971 lightcurve for illustration. Now the variation at the transit minimum reaches almost half the amplitude of the lightcurve during the last years itself. It is larger than the adopted luminosity of the secondary.

The only reliable tool for the determination of minimum times seems to be the incidence of the second and third contact at occultation. From these phases an (O-C)-value of + $0^{d}.012$ has been adopted (ephemeris by Binnendijk, 1969), suggesting an increase of the period since 1976. Possibly rapid changes in the degree of contact are taking place. A publication of more details and further observations are planned for the near future.

M. HOFFMANN

Observatorium Hoher List
der Universitäts-Sternwarte Bonn
5568 Daun/Eifel

References:

Binnendijk, L., 1969, Astron.J. 74, 211
Carr, R.B., 1971, Publ.Goodsell Observatory 16
Hoffmann, M., 1978, Astron. Astrophys. Suppl. 33, 63

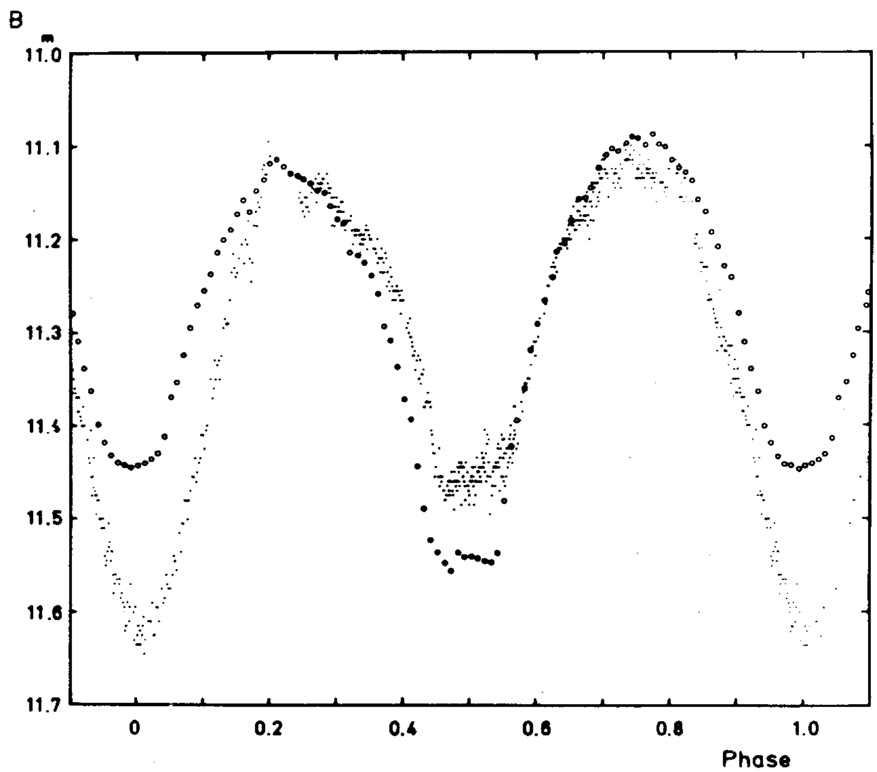


Figure 1: B lightcurves of TZ Bootis. Small dots: 1978 observations, open circles: 1970 normal points.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1488

Konkoly Observatory
Budapest
1978 October 17

OBSERVATIONS OF A NOVA IN THE LARGE MAGELLANIC CLOUD

On March 14, 1977, Graham has discovered a nova in the Large Magellanic Cloud (Graham et al., 1977). Photoelectric measurements have been published by Lewis and Walker (1977) and by van Genderen (1977).

The nova has been observed in UBV with the 61cm Cassegrain telescope of the Astronomical Institute of the Ruhr University of Bochum at the European Southern Observatory (La Silla,Chile). The measurements are listed in Table 1. Figure 1 shows the V data. To match the measurements of the several authors in the first days after discovery, a correction of $+0\overset{m}{.}3$ should be applied to the measurements of van Genderen. Later on this correction seems to become smaller. The measurements of Lewis and Walker coincide with the measurements published here. Little differences in the spectral sensitivities of the photometric system may hold for these discrepancies. In the same way the B-V data of van Genderen need a correction of $-0\overset{m}{.}1$.

The very smooth and quite quick decline of the V curve confirms the previously published measurements. The B-V data show a strong post maximum rise to the blue, a halt at $-0\overset{m}{.}15$ between JD 2443228 and JD 2443245, and a slow rise afterwards. From the U data a typical post maximum development can be deduced for the two colour index diagram (Seitter, 1978). The interstellar absorption seems to be low.

The t_3-time (Schmidt-Kaler, 1957) can be determined to 18^d. This means an absolute magnitude of $-8\overset{m}{.}3$. Assuming a maximum brightness of $m_V = 10\overset{m}{.}5$, a distance modulus of $18\overset{m}{.}8$ results, which is in good agreement with the distance of the LMC. According to Seitter (1978) a radius of $120 R_\odot$ follows for the time of the beginning of the observations published here.

Table 1

All times in JD Hel.+2443200

t	V	B-V	U-B	t	V	B-V	U-B
19.616	11.33	.14	-.61	33.590	13.51	-.15	-.77
20.537	11.40	.08	-.55	34.526	13.80:	-.2	
21.525	11.69	.03	-.70	35.515	13.55:	-.2	
22.521	11.81	.04	-.78	36.526	13.55:	-.1	
23.521	12.05	.05	-.71	37.516	13.75:	-.1	
24.724	12.20			38.567	13.85:	-.1	
25.539	12.56	-.13	-.77	40.513	13.91	-.11	-.74
26.517	12.49	-.07	-.79	42.538	14.10	-.15	-.80
27.504	12.82	-.12	-.81	43.518	14.30:	-.2	
28.501	12.95	-.12	-.82	44.535	14.05:	-.1	
29.523	13.02	-.18	-.73	45.516	14.25:	-.2	
30.518	13.11	-.10	-.78	46.519	14.44	-.25	-.79
31.519	13.30			48.539	14.50:	-.2	
32.554	13.50	-.21	-.77	49.524	14.45:	-.3	

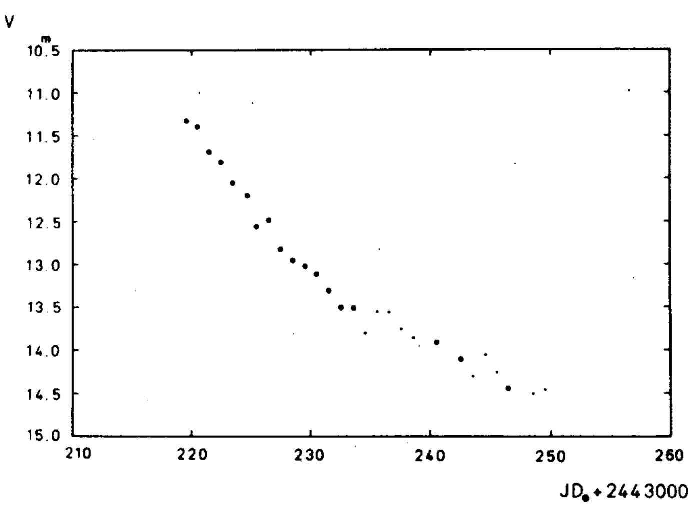


Figure 1.: V curve of the nova. Small dots have lower weight.

M. HOFFMANN
Observatorium Hoher List
der Universitäts-Sternwarte Bonn
5568 Daun/Eifel

References:
Graham, J.A., Rojas, H., Cantera, R., 1977, IAU Circular 3049
Lewis, B.M., Walker, W.S.G., 1977, IAU Circular 3069
Schmidt-Kaler, Th., 1957, Zeitschr. Astrophys. 41, 182
Seitter, W.C., 1978, Mitteilungen Astron. Gesellsch. 43, 206
van Genderen, A.M., 1977, IAU Circular 3082

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1489

Konkoly Observatory
Budapest
1978 October 17

NARROW BAND OBSERVATIONS OF THE RS CVn BINARY TY PYXIDIS

Recently studies of TY Pyxidis have been published by Andersen and Popper (1975) and by Surendiranath et al. (1978). In March and April 1977 an investigation of several later type stars suspected to carry star spots has been undertaken.The stars have been observed with the photometer at the 61cm Cassegrain telescope of the Astronomical Institute of the Ruhr University of Bochum at the European Southern Observatory in La Silla, Chile. The photomultiplier was a refrigerated EMI 9502A tube, the filters were Johnson's B, at 5125A (Hw 45A), 5170A (Hw 40A), and 6750A (Hw 200A). The narrow bands have been specially selected for the observation of star spot sensitive spectral regions. First observations in this colour system have been published by the author (1978), more detailed studies of the other program stars are in progress.

The observations of TY Pyx are shown in Table 1. Comparison star was HD 77087. The times of the observations are equivalent to the phases 0.7, 0.98 and 0.03 using the ephemeris given by Andersen and Popper (1975). The colour indices do not show any significant changes at these phases. Therefore it should be concluded that no larger star spots were visible at the time and phases of the observations.

M. HOFFMANN
Observatorium Hoher List
der Universitäts-Sternwarte Bonn
5568 Daun/Eifel

References:

Andersen, J., Popper, D.M. 1975, Astron.Astrophys. 39, 131
Hoffmann, M., 1978, Mitteilungen Astron. Gesellsch. 43, 186
Surendiranath, R., Vivekananda, Rao, P., Sarma, M.B.K., 1978
Acta Astr. 28, 231

Table 1

All times in JD Hel.+2443240

t	ΔB	t	Δ6750	t	Δ5170	t	Δ5125
5.4990	.335	5.4993	.765	5.4997	.540	5.5001	.550
5.5047	.330	5.5009	.750	5.5004	.545	5.5058	.545
6.4892	.480	5.5050	.730	5.5054	.550	6.4905	.685
6.4948	.440	5.5066	.785	5.5062	.540	6.4959	.640
6.5307	.320	6.4897	.795	6.4901	.700	6.5330	.535
8.5833	.325	6.4914	.765	6.4909	.670	8.5855	.575
9.5405	.570	6.4951	.895	6.4955	.640	9.5414	.770
9.5481	.610	6.4968	.910	6.4963	.645	9.5489	.825
		6.5314	.705	8.5848	.565		
		6.5346	.855	8.5863	.590		
		8.5841	.840	9.5410	.790		
		8.5870	.780	9.5421	.795		
				9.5485	.820		
				9.5492	.835		

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1490

Konkoly Observatory
Budapest
1978 October 18

VARIABILITY AMONG STARS OF SPECTRAL CLASS S !

Stephenson's (1976) "A Catalogue of S Stars" includes 24 that have been classified as S! by either Stephenson (21 stars) or Sanduleak (3 stars). The comment was made that probably all stars so classified are variable. Among the 24, eight had already been confirmed as variable: 4 Mira, 3Lb and one SRa .Two others are contained in the Catalogue of Suspected Variables, CSV1356 and CSV1482. For the regions of two of those not previously suspected of variability, Nos. 557 and 566 in Stephenson's Catalogue, plates are available at the Maria Mitchell Observatory.Both stars prove to be typical Mira type variables.

For 557 at $18^h21^m17^s$ $-14^\circ45'17''$, 110 plates spanned the interval JD 26889 - 43697, while the only earlier plate on the region, taken JD 22611, showed the star at maximum. The range of magnitude is provisionally 13.0 to 15.0 pg. The observations are satisfied by

$$\text{Max} = \text{JD}2442940 + 398E.$$

Star 566 at $18^h29^m21^s$ $-22^\circ42'51''$ I had some difficulty in identifying in the crowded Sagittarius field. Dr. Stephenson therefore kindly supplied me with a finder chart. The star marked a in Figure 1 appeared to vary slightly but this could have been

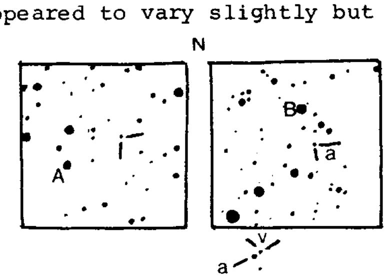


Figure 1. Finder charts,approximately 10'x 10',for Stephenson's S!-stars, Nos. 557 (left) and 566 (right).The variable star 566 is a companion about 0!3 north preceding star a.A is BD-14°5054, and B is BD-22°4793.

a deceptive effect of the overlapping of adjacent images. The better of the available plates revealed a companion about 0'.3 N which was intermittently as bright as a. This normally faint companion is presumably the star with the S-type spectrum. Its magnitude appears to vary from 14.3 to 15.5 pg. The average color index for those S! stars for which Stephenson listed both photographic and visual magnitudes is 2.7. Hence the difference between my photographic magnitude and his visual is reasonable. Among the 600 plates of the region, only 90 showed unblended images. These observations are represented by

$$\text{Max} = \text{JD } 2443000 + 369\text{E}.$$

Table I lists the other S! stars which remain to be discovered as variable. The visual magnitudes listed are from Stephenson's Catalogue.

Table I

Stars with S!-Type Spectra to be Investigated for Variability.

Stephenson Cat. No.	R.A. (1900)	Dec.	m_{vis}
10	$0^h38^m44^s$	+ 63°13!6	12.0
123	5 52 43	+ 35 07.5	9.9:
139	6 08 02	+ 28 09.6	10.7
223	7 15 57	− 7 37.2	11.3
297	8 08 13	− 30 56.3	11.8
359	9 18 27	− 42 13.0	12.4
397	10 22 18	− 51 59.2	12.6
408	10 35 58	− 52 41.1	11.6
489	14 50 53	− 63 00.9	11.0
519	17 13 44	− 24 49.0	11.8
687	21 28 04	+ 61 07.0	11.8:
727	23 10 48	+ 49 46.2	10.6:

Another star, No. 576 with spectral class S4,2 and identified as CoD −23°14695, 11.0 m_v (CoD mag. 9.6) has been examined on Nantucket plates without success. The star I have taken to be CoD −23°14695 is photographically bright, about 11.5 pg. Plates of better resolving power are required to detect if this star has a red companion possibly fainter than 13 pg.

This work was carried out under NSF Grant AST78-07405.

DORRIT HOFFLEIT
Maria Mitchell Observatory
Nantucket, Mass.02554 U.S.A.

Reference:

Stephenson, C.B. 1976, Pub.Warner and Swasey Obs. Vol. 2 No.2

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1491

Konkoly Observatory
Budapest
1978 October 18

PHOTOMETRY OF HZ Her

Recent observations (Hutchings 1978) showed some changes in spectrum of HZ Her. To check photometric behaviour of the star UBVR observations were obtained occasionally during an observing run with No.4-16 inch telescope of Kitt Peak National Observatory. The star was observed from August 20 until August 27, 1978. The star B (Grandi et al. 1974) was comparison star. The observations in instrumental system are plotted in Fig.1. The phases have been calculated using the X-ray eclipse elements (Giacconi et al. 1973).

The scatter of points is due to internal flickering and faintness of the star for a small telescope. It is obvious, however, there is no dramatic change in colours and amplitudes of variations of brightness with respect to the earlier observations (see e.g. Grandi et al. 1974). The fragmentary data prevent extension of the above statements into details of light curve.

The author would like to thank Dr. John Hutchings for communicating results of his observations before publication and Dr.Bohdan Paczyński for interest and encouragement during this work.

The research was supported by NSF/Curie-Sklodowska Foundation under grant INT-76-80588.

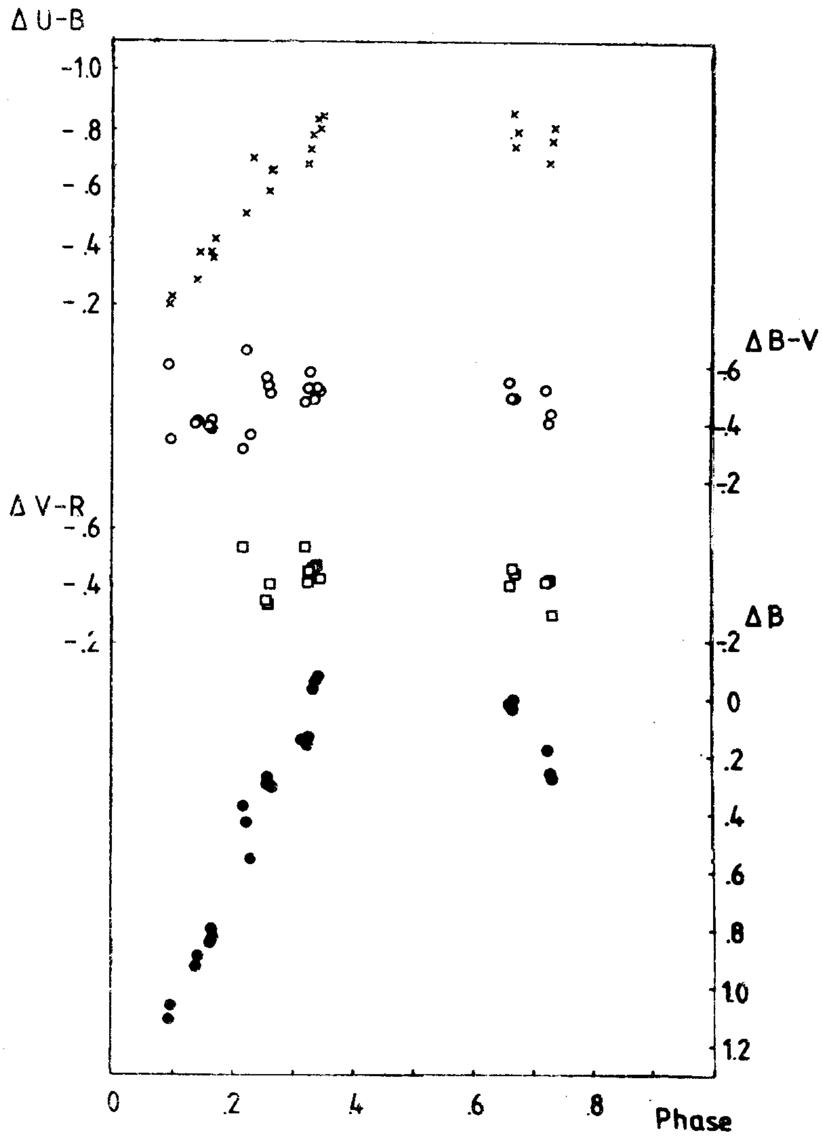
ALEKSANDER CZERNY-SCHWARZENBERG
Astronomical Observatory
of Warsaw University
Warszawa, Ujazdowskie 4,
Poland, 00-478

References:

Giacconi, R., Gursky, H., Kellog, E., Levinson, R., Schreier, E., and Tananbaum, H. 1973, ApJ 184, 227

Grandi, S., Hintzen,P., Jensen, E., Rydgren.,A., Scott, J., Stickney, P., Wheelan, J., and Worden,S. 1974,ApJ.190,365

Hutchings,J. 1978, IAU Circ. 3253



Δ U-B
-1.0
- .8
- .6
- .4
- .2
Δ B-V
.6
.4
.2
Δ V-R
-.6
-.4
-.2
Δ B
.2
0
.2
.4
.6
.8
1.0
1.2
0
.2
.4
.6
.8
Phase

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1492

Konkoly Observatory
Budapest
1978 September 20

THE UV SPECTRUM OF HR 8752

In recent years the super-luminous star HR 8752 (HD 217476 currently G5 0-Ia) has been undergoing a continuous change in spectral type (see Lambert and Luck, 1978) and has been detected as a radio source by Smolinski et al. (1977). We have observed it with the International Ultraviolet Explorer as part of a programme to study variable and emission-line stars. Spectra were obtained at low resolution (6A) with both spectrographs: in the short wavelength region (1150A - 2000A) on 1978 July 24 and in the long wavelength region (1800A - 3000A) on 1978 August 1.

The spectrum recovered was that of an early type star. From the Si IV (1398) / C IV (1549) ratio we estimate the spectral type to be about B1 using the calibration of Molnar (1975); from the level of the exposure and the duration of the exposure, we deduce an apparent visual magnitude (after allowance for reddening) of about +11. If the absolute magnitude of the G-type star is taken as -9, this suggests that the hot companion is close to the main sequence. It seems probable to us that this early type companion is responsible for the excitation of the shell which gives rise to the forbidden [N II] emission lines (Sargent, 1965) and the free-free radio emission.

A more detailed account will be prepared and submitted to Astronomy and Astrophysics in due course.

D.J. STICKLAND
UK IUE Project, ESA Satellite Tracking Station, Apartado 54065
Madrid, Spain

F. BEECKMANS, P. BENVENUTI, J. CLAVEL, A. HECK, F. MACCHETTO,
M.V. PENSTON, P.L. SELVELLI
Astronomy Division, ESTEC, ESA Satellite Tracking Station,
Apartado 54065, Madrid, Spain

References:

Lambert, D.L., Luck, R.E., 1978, Mon.Not.R.Astron.Soc., 184,405

Molnar, M., 1975, Astrophys.J., 200, 106

Sargent, W.L.W., 1965, Observatory, 85, 33

Smolinski, J., Feldman, P.A., Higgs, L.A., 1977, Astron. Astrophys., 60, 277

Editor's note: This paper came to the editor's hand on September 20, 1978. Its release, however,had to be delayed until the appearance of the commissioning phase papers.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1493

Konkoly Observatory
Budapest
1978 September 21

Z ANDROMEDAE: IUE AND OPTICAL OBSERVATIONS IN 1978

Since many years the symbiotic star Z Andromedae is in a quiescent phase (Mattei 1978), and coordinated optical and ultraviolet observations may hold an important clue to identify the stellar components of this classical object.

Low resolution IUE spectra (1150-3300 A) of Z And were obtained on 1978, May 5 and June 13. The UV spectrum is dominated by strong emission lines, both permitted and forbidden, having a wide range of ionization energy. Very prominent are HeII 1640 to 3202, CIV 1550, NV 1240, OIII 3133.

Near 2200 A the emission line spectrum is probably depressed by the interstellar absorption band, indicating that Z And is a somewhat reddened. In the far UV, where the crowding of the emission lines is less severe, a smoothed continuum is present under the emission lines. The dereddened energy distribution corresponds to that of an early B or O-type star.

Several objective prism spectra (3400-8800 A) of Z And were obtained at the Campo Imperatore Schmidt telescope of the Roma Astronomical Observatory during October 1977, and July-August 1978. The star shows a typical symbiotic spectrum with several high excitation emission lines, in particular [FeVII], the Balmer continuum in emission, and an intense red-infrared spectrum dominated by the TiO bands, whose strength corresponds to an M6 spectral type.

Small variations of emission line intensities were observed during 1977-78.

In July 1978 the visual magnitude of Z And, estimated from the count rate of the fine error sensor of IUE, was about $10^{m}.3$.

This work is based on observations by the International Ultraviolet Explorer collected at the Villafranca Satellite Tracking Station of the European Space Agancy.

G.B. BARATTA

Osservatorio Astronomico, Roma

A. CASSATELLA

ESA Villafranca Satellite Tracking Station, on leave of absence from Laboratorio di Astrofisica Spaziale, Frascati

A. ALTAMORE

Istituto Osservatorio Astronomico, Università di Roma

R. VIOTTI

Laboratorio di Astrofisica Spaciale, Frascati

Reference:

Mattei, J.A. 1978, J.Roy.Astron.Soc.Can. 72, 61

Editor's note: This paper came to the editor's hand on September 21, 1978. Its release, however, had to be delayed until the appearance of the commissioning phase papers.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1494

Konkoly Observatory
Budapest
1978 October 23

BV - OBSERVATIONS OF CH CYGNI IN 1977

CH Cyg is a well known semiregular variable star which was new classified for spectroscopic reasons as Z And star (GCVS First Suppl., 1971). Two outbursts were observed and a third was announced by visual AAVSO observers (John E. Bortle, AAVSO Circulars No. 79 and No. 80, 1977). Unfortunately the weather conditions were so bad that only four photoelectric observations could be done with the 31 cm refractor at Berlin. An uncooled 1P21 photomultiplier was used behind Schott filter combinations BG 12 + GG 13 for B and GG 11 for V.

Julian Date	V	B-V	N
2443 $287\overset{d}{,}55$	6.57	$+1\overset{m}{.}31$	1
289,44	6.43	+1.32	3
319,45	6.67	+1.29	2
328,42	6.60	+1.19	2

The measurements are as good as $0\overset{m}{.}02$ in V and $0\overset{m}{.}01$ in B-V, N is the number of individual observations.

The magnitudes of the comparison stars were determined with nearby UBV standard stars in two nights. One of the four used comparison stars, SAO 048428(F8), may be slightly variable as indicated by unusually great scattering of the measurements.

U. HOPP, S. WITZIGMANN
Wilhelm Foerster Sternwarte,
Berlin

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1495

Konkoly Observatory
Budapest
1978 October 24

PHOTOELECTRIC MINIMA OF DI PEGASI

Following are the results of observations made at the Ankara University Observatory with a 30 cm Maksutov telescope, an EMI 6256 S photomultiplier tube and standard B,V filters:

Hel.Min.J.D.	m.e.	Min.	Colour	E	O - C
2443725.5179	±.0009	II	V	5072.5	+.0002
29.4335	2	I	B	5078	8
29.4333	2	I	V		6
56.4831	4	I	B	5116	14
56.4832	5	I	V		15
80.3277	8	II	V	5149.5	2

The method of Kwee and van Woerden (1956) was used in the calculations of the times of minima and the associated mean errors. The last column was calculated using the following formula (Binnendijk AJ 78,97,1973)

Min. I. = J.D. 2440114.8356 + 0.7118151·E.

ZEKI TÜFEKÇİOĞLU

Ankara University Observatory
A.Ü.Fen Fakültesi
Ankara-Turkey

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1496

Konkoly Observatory
Budapest
1978 October 25

88 HER : ANOTHER SHELL STAR OF PLEIONE TYPE

Harmanec et al.(1978) discovered the long-term variations in light and color of the shell star, 88 Her (B6e). The varation is characterized by a gradual increase during 1968-1972, by a phase of more or less constant light in 1972-1976, and by a steep decline in 1977. The brightening of the star was accompanied by gradual disappearance of the hydrogen emission in its spectrum (Doazan 1973; Harmanec et al. 1974, 1978). These behaviors resemble closely to those of Pleione (B8e) in 1960-1972 (Hirata and Kogure 1976; Sharov and Lyuty 1976). In the case of Pleione, the shell lines appeared in 1972, and the Hα emission reappeared at the same time or immediately thereafter when the brightness decrease was remarkable (Hirata and Kogure 1976; Gulliver 1977). The broad component of the CaII K line appeared prior to the brightness decrease and strenghthened in the subsequent shell phase.

From the resemblance of the variations of these two stars, we have planned to examine the spectroscopic behavior of 88 Her in the dark phase. The coudé spectrograms in the blue and red regions were obtained with the 188-cm reflector at the Okayama Astrophysical Observatory in August 11 and 14, 1978, respectively. The respective inverse linear dispersion was about 10 and 20 Å/mm in the blue and red regions. Figure 1 shows the microphotometric tracing of the Hα line. Although this plate was underexposed, the double emission components well above the continuum level are clearly seen, together with the strong central shell component. In the blue region, the metallic shell lines of rather diffuse appearance and the strong shell components of the hydrogen Balmer lines up to H28 were detected. Figure 2 shows the

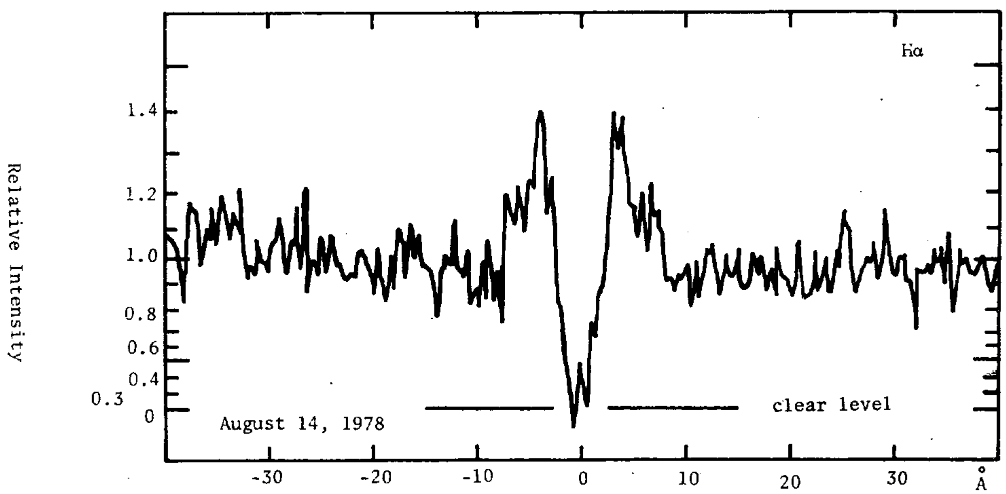

Hα
1.4
1.2
1.0
0.8
0.6
0.4
0.3
0
August 14, 1978
clear level
-30
-20
-10
0
10
20
30
Å
Relative Intensity

Figure 1

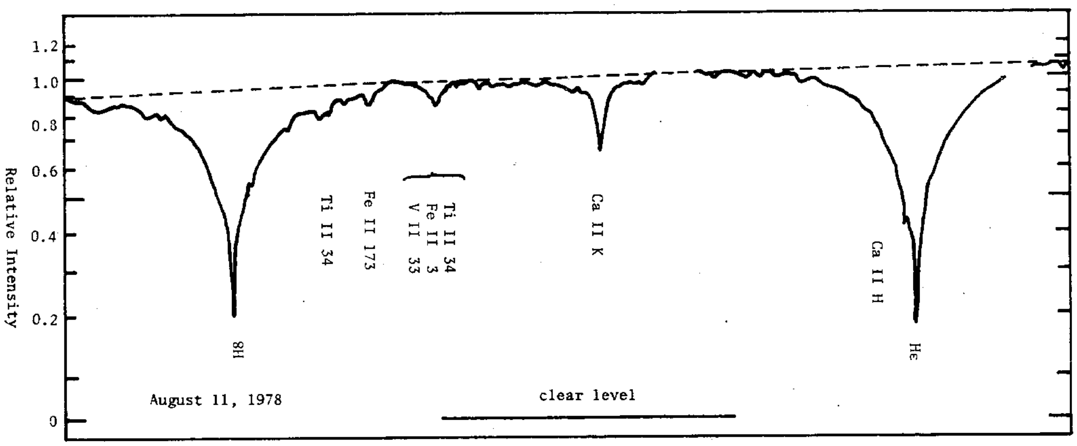

Relative Intensity
1.2
1.0
0.8
0.6
0.4
0.2
0
Ti II 34
Fe II 173
Ti II 34
Fe II 3
V II 33
Ca II K
Ca II H
H8
Hε
August 11, 1978
clear level

Figure 2

microphotometric tracing in the H8-Hϵ region. The general trend of the shell appearance is clearly seen. We also notice that the broad component of the CaII K line with a half half-width of about 200 km/sec is traced in addition to its sharp shell component.

The UBV data of 88 Her were kindly offered to the author from M. Nakagiri of the Tokyo Astronomical Observatory. The differential observation to HD 162132 (A0) was made in 1978, August, 19.53 UT with the 30-cm reflector at the Tokyo Astronomical Observatory. The results were:

$$V = 6^{m}.83 \pm 0^{m}.00, \quad B-V = -0^{m}.09 \pm 0^{m}.00, \text{ and } \quad U-B = -0^{m}.38 \pm 0^{m}.00.$$

The results for the comparison star, HD 162132, were

$$V = 6^{m}.48 \pm 0^{m}.00, \quad B-V = +0^{m}.08 \pm 0^{m}.00, \text{ and } \quad U-B = +0^{m}.13 \pm 0^{m}.01,$$

while Harmanec et al. (1978) gave for this star

$$V = 6^{m}.493, \quad B-V = +0^{m}.070, \text{ and } \quad U-B = +0^{m}.080.$$

The values of V and B-V of HD 162132 agree well in both observations, but the U-B color is redder in our observation by an amount of $0^{m}.05$. When compared with the latest observation (December 4, 1977) of Harmanec et al. (1978):

$$V = 6^{m}.870 \pm 0^{m}.006, \; B-V = -0^{m}.102, \text{ and } \quad U-B = -0^{m}.421,$$

we can conclude that 88 Her is still in the dark phase and brightened slightly. It cannot be judged at present whether this slight brightening corresponds to the steady recovery of the brightness or to the irregular change with a shorter time scale.

The common behaviors of 88 Her and Pleione are summarized as follows.

1. Gradual brightening and subsequent rapid decline in the U,B, and V magnitudes.

2. Reddening in the B-V color in the steep decline stage.

3. Gradual disappearance of the emission feature in the brightening phase and its recovery in the dark phase.

4. Appearance of the shell absorption feature in the midst of dark phase.

5. Existence of the broad component of the CaII K line in the dark phase.

Several different behaviors of these two stars can be also pointed out:

1. The variations of magnitude and color are more conspicuous in Pleione than in 88 Her. The magnitude differences between the brightest and subsequent faintest stages are

	ΔV	ΔB	ΔU
88 Her	$\sim 0^{m}.19$	$\sim 0^{m}.23$	$\sim 0^{m}.33$
Pleione	$\sim 0^{m}.37$	$\sim 0^{m}.40$	$\sim 0^{m}.37$.

Here, we tentatively adopt the latest observation of Harmanec et al. (1978) as the faintest. In addition, the decrease in brightness of 88 Her was more conspicuous in the shorter wavelength, while Pleione exhibited the same order-of-magnitude decrease in all bands. As a result, the U-B color became redder in 88 Her, while it became even bluer in Pleione.

2. Pleione has experienced Be→B→shell phase in its recent spectroscopic behavior, while 88 Her exhibited shell→weak Be (or B)→shell phase.

88 Her is a spectroscopic binary with a period of about 87 days (Harmanec et al. 1972). Any evidence of binary character has not yet been found in Pleione (Gulliver 1977).

Further monitoring in both photoelectric and spectroscopic observations is of great interest.

RYUKO HIRATA
Department of Astronomy
University of Kyoto
Kyoto, 606 Japan

References:

Doazan V. 1973, Astron. Astrophys., 27, 395.

Gulliver, A.F. 1977, Astrophys. J. Suppl., 35, 441.

Harmanec, P., Horn, J., Koubský, P., Kříž, S., Žďárský, F., Papoušek, J., Doazan, V., Bourdonneau, B., Baldinelli, L., Ghedini, S., and Pavlovski, K. 1978, Bull. Astron. Inst. Czech., in press.

Harmanec, P., Koubský, P., and Krpata, J. 1972, Bull. Astron. Inst. Czech., 23, 218.

Harmanec, P., Koubský, P., and Krpata, J. 1974, Astron. Astrophys., 33, 117.

Hirata, R., and Kogure T. 1976, Publ. Astron. Soc. Japan, 28, 509.

Sharov, A.S., and Lyuty, V.M. 1976, in Be and Shell Stars, IAU Symposium No. 70, ed. A. Slettebak (Reidel Publ. Co., Dordrecht), p. 105.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1497

Konkoly Observatory
Budapest
1978 October 27

THE LIGHT CURVE OF 44 i BOOTIS IN 1978

44 i Boo was observed on April 5/6, 1978, with the 75 cm reflector of the Wilhelm Foerster Observatory (Hopp et al. 1977), and on April 6/7, 8/9, 9/10, May 4/5 and 9/10, 1978, with the 35 cm Cassegrain telescope of the Hoher List Observatory (Duerbeck 1978). The first set of observations covers a primary minimum, and was used to derive a minimum time. The second set, whose accuracy is not as high as in previous years due to less favorable sky conditions, was used to derive a mean light curve, with normal points formed from 5 individual observations. The B and V light curves, relative to HR 5581, are shown in Figure 1. The times of minimum light are reduced to J.D. 2 443 607.

The O - C values of the observed minimum times are, according to the elements of Duerbeck (1975) :

J.D.hel. (2 443 000 +)	O - C	m.e.	Observer	
604.588	-0.003	±0.003	Hopp et al.	
607.5379	+0.0009	±0.0013	Duerbeck & Karimie	(primary min.)
607.8107	+0.0059	±0.0026	" "	(secondary min.)

The period has obviously remained constant; the significant deviation of the secondary minimum is possibly caused by a disturbance in the light curve.

In both colours, the primary minimum is $0^m.016$ deeper than the secondary minimum, and the maximum at phase 0.25 is $0^m.011$ higher than that at phase 0.75. Considering the inequality of the maxima in previous years (Duerbeck 1978), the maximum at phase 0.25 has continuously increased in height, and it is now the higher one.

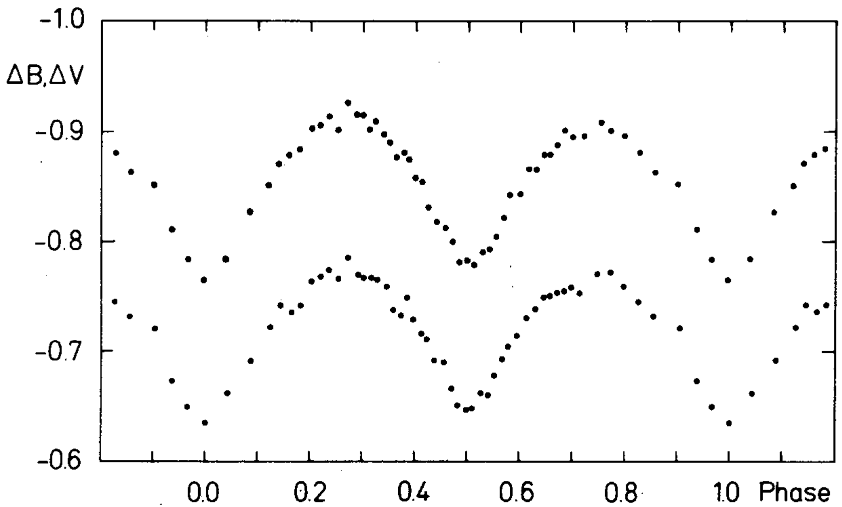


Fig. 1. Light curves of i Boo relative to HR 5581- upper: B, lower: V.

H.W. DUERBECK and M.T. KARIMIE*

Observatorium Hoher List
der Universitäts-Sternwarte Bonn
5568 Daun/Eifel, F.R.G.

U. HOPP, M. KIEHL, and S. WITZIGMANN

Wilhelm-Foerster-Sternwarte
1000 Berlin 41, F.R.G.

*Stipendiat der Humboldt Stiftung,
Bonn-Bad Godesberg, F.R.G.

References:

Duerbeck, H.W. 1975, Inf. Bull. Var. Stars 1023

Duerbeck, H.W. 1978, Astr. & Astrophys. Suppl. Ser. 32, 361

Hopp, U., Witzigmann, S., Kiehl, M. 1977, Inf. Bull. Var. Stars 1353

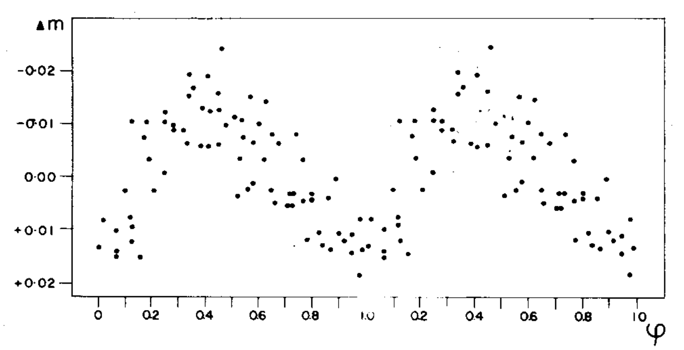
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1498

Konkoly Observatory
Budapest
1978 November 2

SHORT PERIOD VARIABILITY OF HD 153747

HD 153747 was observed photoelectrically in B filter with the 61 cm telescope at the Abrahão de Moraes Observatory-USP. This star has been used as comparison (SAO 208337) for HD 153919 by Pacheco et al. (1974) who suggested that it could have small amplitude variations.

Two series of observations were taken, on 28/29 and 29/30 June 1978. On both nights, variations with amplitude $\Delta m \simeq 0.02$mag and 67 minutes period were present (see figure). HD 153919 was observed simultaneously and the random fluctuations were $\Delta m \simeq 0.003$ mag.



Phase diagram for the data folded module 67 min.
Phase zero is JD 2443688.56.

The magnitude and colors observed by Pacheco et al.(1974) are: V = 7.41; B-V = 0.05; U-B = -0.20, consistent with catalog spectral type B9.

The interpretation for the observed variable behaviour is not clear. A plausible guess is that HD 153747 is a magnetic star. Some of these stars present short period, small amplitude variations (Bahner and Mavridis, 1957; Rakos, 1963; Kurtz, 1978) superposed on the main period (0.5 - 200 d). Furthermore, the spectral type is compatible with this interpretation and with no other type of classical variable stars of binary systems with this period.

J.E. STEINER, F.J. JABLONSKI* and
C.D. GNEIDING*
Instituto Astronômico e Geofísico
Universidade de São Paulo
C.P. 30627 - São Paulo - SP.
Brasil

*Supported by CNPq

References:

Bahner, K. and Mavridis, L.N., 1957, Z.Astrophys., 41, 254
Kurtz, D.W., 1978, I.B.V.S. No. 1436
Pacheco, J.A. de Freitas, Steiner, J.E. and Quast, G.R., 1974
Astron. and Astrophys. 33, 131
Rakos, K.D., 1963, Lowell Obs. Bull. 6, 91

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1499

Konkoly Observatory
Budapest
1978 November 3

FAR-ULTRAVIOLET PHOTOMETRY OF RY SAGITTARII

During the flight of the Netherlands Astronomical Satellite ANS far-ultraviolet photometry of the R Coronae Borealis-type star RY Sagittarii was carried out. The observations were done on 5 April 1976 beginning at $20^h13^m20^s$. Alternately an integration of 64 seconds on the star and of 32 seconds on a field 5′ away from the star was performed. The following filters were used: 1549 Å (149 Å), 1799 Å (149 Å), 2200 Å (200 Å), 2493 Å (150 Å), 3294 Å (101 Å). Between brackets the width of each band is indicated; the bands are to a good approximation rectangular. The total number of useful integrations at each band is 8. To convert the results to absolute flux, ANS observations of B3 V stars were used together with a blanketed model atmosphere of Kurucz (see Wesselius and Koester,1978). The flux values for RY Sgr are given in the Table:

λ, Å	2200	2500	3300
F_λ; in units 10^{-14} erg $s^{-1}cm^{-2}Å^{-1}$	9.45 ±0.31	17.47 ±0.91	283.8 ±5.7

At 1550 Å and 1800 Å no signal has been detected (within the accuracy of measurements).

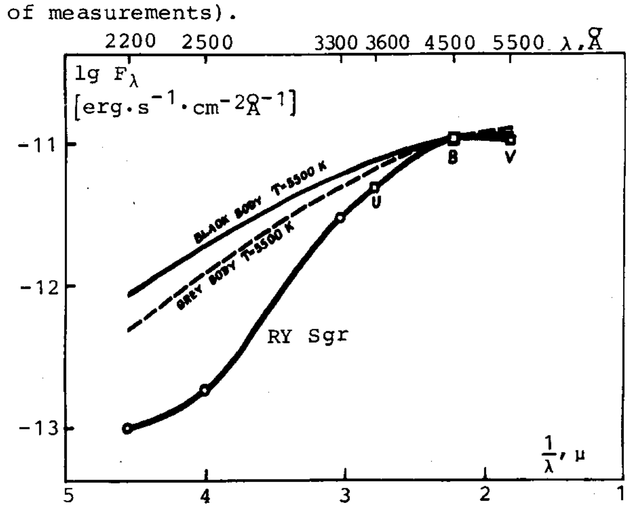


Figure 1 shows the resulting fluxes for RY Sgr as well as the magnitudes U,B,V for maximum brightness of this star taken from Alexander et al. (1972) and converted to absolute fluxes. For comparison we give also the calculated energy distribution for a black body and for a grey body with a temperature of T=5500 K (normalized to λ 4500 Å).

We have estimated the possible intensity of a graphite band at λ2200 Å and arrive at the conclusion that this band is absent in the spectrum of RY Sgr. It would be very interesting to perform observations of this star at active phase (light minimum) when the graphite band may appear due to strengthening of the circumstellar envelope.

B.E. ZHILYAEV, M.Ya. ORLOV,
P.R. WESSELIUS

Main Astronomical Observatory
Ukrainian Academy of Sciences
252127, Kiev, Goloseevo,U.S.S.R.

References:

Alexander, J.B. et al., 1972, Mon.Not.R.Astr.Soc., 158, 305
Wesselius, P.R., Koester, D., 1978, Astron.Astrophys. (Submitted)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1500

Konkoly Observatory
Budapest
1978 November 8

A SPECTRAL ANALYSIS OF THE LIGHT CURVE OF THE RV Tau STAR EP Lyr

As it is well known, the maximum entropy method is so far the powerful one to estimate the power spectra of time series with equally spaced data (Percy, 1977 and references therein).

This method has been applied to analyse the light curve of the RV Tau star EP Lyr, since of this star there is a long run of photoelectric observations, which has sufficient continuity to be uniformly sampled (Wachmann, 1968).

The power spectrum has been computed using the Burg recursive procedure and adopting the Akaike criterion to choose the length of the error prediction filter (Richer and Ulrych, 1974).

In Fig. 1 we have the spectrum, which as in abscissae the frequencies (cycles to day), and in ordinates the logarithm of the power. This spectrum has been computed from the V observations made between J.D. 2439614 and J.D. 2439814. The data have been connected with a free hand curve and then this has been sampled with a step of 5 days.

It can be seen that the formal period of the star yields a series of peaks, which are due to its harmonics (the order of each one is written above the downward arrows). The period, which has been determined fitting these harmonics with the least squares, is of 84.2 ± 2.5 days, which is in good agreement with the one of 83.315 given by Wachmann, who determined it using a very long series of minimum epochs. Moreover there are two other peaks (upward arrows) at the frequencies of about 0.023 and 0.067 c/d.These peaks are the responsible of the not perfect regularity of the light curve. The higher of these two peaks is very close to the one due to the 2^{o} harmonic of the formal period; so it is bad resolved. Its position can be estimated only with approximation, since in such cases the peaks tend to depart one from the other.

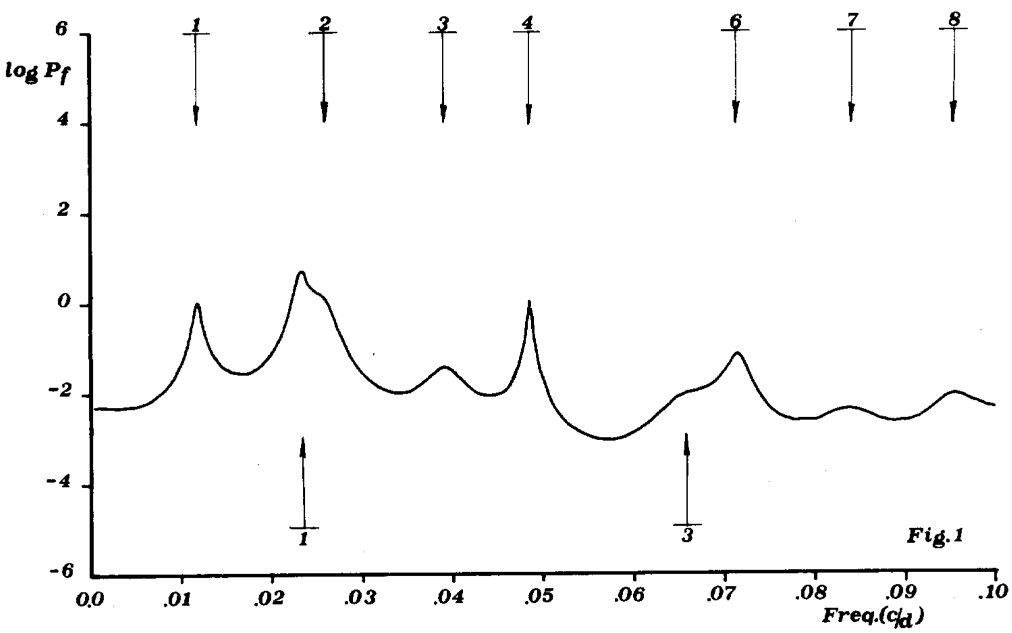
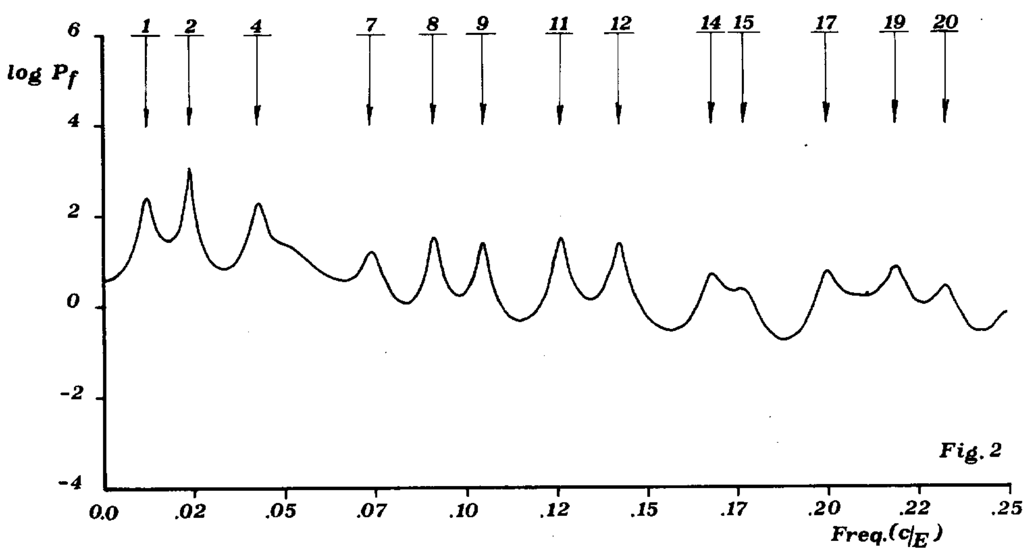


Fig.1



1
2
4
7
8
9
11
12
14
15
17
19
20
6
log P_f
4
2
0
-2
-4
0.0
.02
.05
.07
.10
.12
.15
.17
.20
.22
.25
Freq.(c/E)

Fig. 2

A similar consideration can be made for the second peak. So probably this one is third harmonic of peak at 0.023 c/d. In such hypothesis it results a second periodicity of 45.1 ± 1.7 days. Unfortunately there are not in the literature other sufficiently long runs of observations to confirm this second periodicity, which till now passed unnoticed owing to its proximity to the 2^{o} harmonic of the formal period.

Wachmann gives also a series of epochs of principal minima (which cover 160 formal periods) and the concerning (O-C),which have been computed with the period $P=83^{d}.315$. The spectrum of this curve, which has been obtained with the same procedure used for the V light curve, has been also computed (Fig.2, in abscissae the frequencies are in cycles to period).

All the peaks in the spectrum are harmonics of a very slow oscillation of 7067 ± 88 days. For this oscillation Wachmann gives a period of 3500 days, which as it can be clearly seen from the spectrum, is only the 2^{o} harmonic of the true period.

LUCIANO MANTEGAZZA
Osservatorio Astronomico
Via Bianchi, 46
22055 Merate (Italy)

References:

Percy, J.R., 1977, Mon.Not.R.Astron.Soc., 181, 647
Richer, H.B., Ulrych, T.J., 1974, Astrophys.J., 192, 728
Wachmann, A.A., 1968, Abh.Hamburg.Sternw.Bergedorf,VIII,4,105